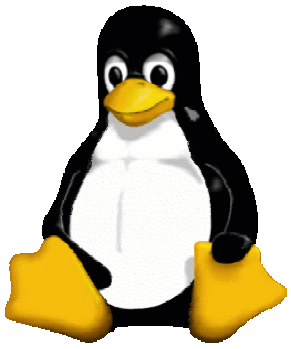
ASU West Library



Evolution 3

2002

Table of Contents

BACKGROUND 1

INTRODUCTION 1
BRIEF HISTORY OF FLETCHER LIBRARY COMPUTING 2
ASSESSMENT 2
EVOLUTION EXPLAINED 4
Questions to be answered 5
COMPUTING ARCHITECTURE MODELS EXAMINED 5
Terminal Server Environment 6
Pure Windows® Environment 8
Web Environment 10
LIBRARY CLASSROOM ISSUES 12
COST SAVINGS 13
RECOMMENDATION 13
NETWORK COMPUTER PROJECT 14
DECISION MEETING AND DISCUSSION CAPSULE 15

PROJECT PLAN 17

PROJECT CHARTER 17
SCOPE CREEP 19
METRICS 21
PROJECT TASK SHEET 23
TOTAL COST OF OWNERSHIP 25
CHALLENGES 26
POST-IMPLEMENTATION ASSESSMENT 30

RESOURCES 31

HARDWARE SPECIFICATIONS 32
Circulation 33
Classroom 34
PAC 35
Server Display Monitor 36
Server-WLIBBACK 37
Server-WLIBBDC 38
Server-WLIBBOOT 1 39
Server-WLIBBOOT2 40
WLIBCLONE 41
WLIBDB 42
WLIBFILE 43
WLIBNET 44
WLIBINFO 45
WLIBSEC 46
WLIBPDC 47
Server-WWW1 48
Server-WWW2 49
WLIBTRIS 50

WLIBBACK –tape storage **51**
Server-WLIBLDAP **52**
Server-WLIBPRINT **53**
SOFTWARE SPECIFICATIONS **54**
PURCHASING **55**

PURCHASING/RECEIVING **55**

Standard Measures used in Equipment Purchase Selection **55**
Standard Measures used in Vendor Selection **56**
Warranty Coverage **57**
Purchasing Worksheet **58**
RECEIVING **63**
Processing **63**
Storage **63**
Disposal **64**
Receiving Labels **65**

NETWORKING **67**

NETWORK BACKGROUND **67**
OLD DESIGN **68**
NEW DESIGN **69**
TOPOLOGY **71**
NETWORK REDESIGN PROJECT **74**
NETWORK UPDATE – OCTOBER 2003 ..... **79**

SERVERS **80**

SERVER OVERVIEW **80**
WLIBINFO **80**
WLIBPDC **81**
WLIBNET **82**
WLIBFILE **83**
WLIBDB **84**
WLIBSEC **85**
WLIBBACK **86**
WLIBBOOT #1 & #2 ..... **87**
WLIBTRIS **88**
WWW1 & WWW2 ..... **89**
WLIBLDAP **90**
WLIBPRINT **91**

CLIENTS **92**

PUBLIC MACHINES **92**
CUSTOMIZING THE CLIENT DESKTOP **94**
PAC STATION NAMES **99**
CLIENT USAGE MONITORING **100**

SERVICES **101**

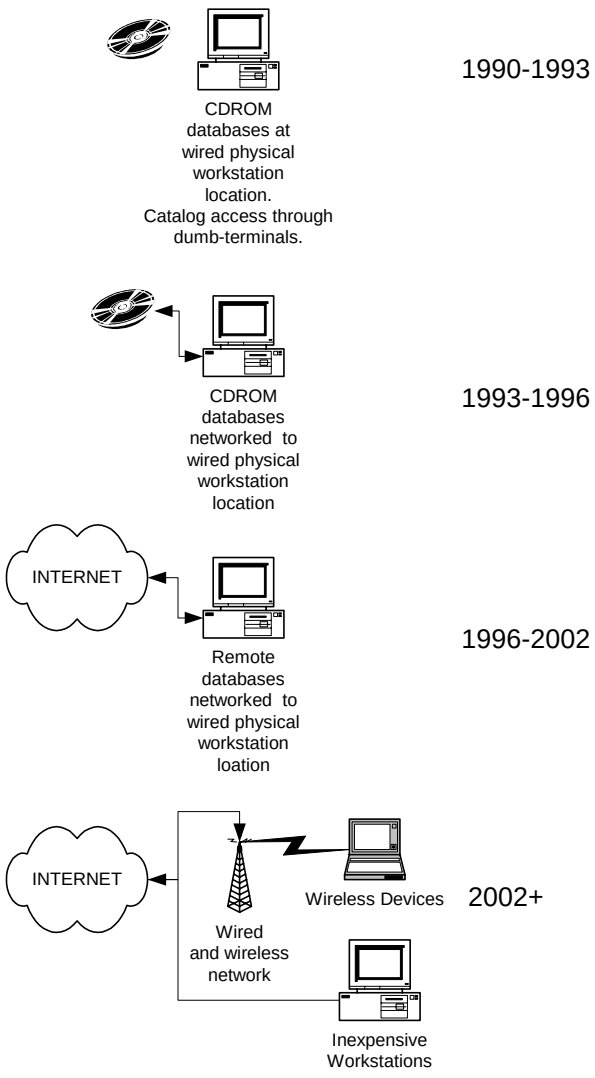
REMOTE BOOT SERVICES 101
Diagram of PXE Boot 103
TROUBLE REPORTING AND INFORMATION SERVICES 104
SUPPORT STAFFING 105
TS&D SUPPORT AREAS 105
JOB RESPONSIBILITIES 107
TSA Coordinator 107
TSA Senior 112
Student Employees 117
RISK MANAGEMENT 118
CATEGORIES OF LIBRARY TECHNOLOGY RISKS 118
RISK ASSESSMENT MATRIX 119
QUALITY ASSURANCE 124
QUALITY ASSURANCE CHECKLIST 125
TESTING 126
SERVICE MEASUREMENT STANDARDS 127
Public Access Workstation Standards 127
Classroom Workstation Standards 128
TRAINING 129
TECHNICAL SUPPORT STAFF 129
KNOWLEDGE MATRIX 130
IMPLEMENTATION 131
CIRCULATION WORKSTATIONS 132
CLASSROOM WORKSTATIONS 146
PAC AND ATRIUM WORKSTATIONS 160
POWER CUTOFF SWITCH 175
NOISE REDUCTION 176
FUTURE 177
DEFINITIONS 178

Introduction

Technology at the ASU West Campus Fletcher Library has been evolving since the Library first opened its doors. From dumb-terminals in the '80s and early '90s, to present-day computer workstations, the evolution of technology continues to introduce change at every step. Many factors influence a change in technology. Changes in design, function, format, performance, and lifespan all directly or indirectly affect how, when, who, where, and why a technology solution is utilized. The Library has been intimately familiar with these aspects.

When the Library transitioned from a dumb-terminal/server architecture to a fat-client workstation architecture, the first obviously visible evolution occurred. Users were able to select resources from a graphical environment and the response speed of applications proved beneficial over the previous architecture. Minor technology changes using this architecture proved beneficial to both the Library and the users needs. These changes were in areas of performance enhancements, standardized application sets, common desktop environments, and quality of services.

The Library purchases its computing assets with a Library-determined lifespan of 36 months. This means every three years the Library will replace its servers and workstations to maintain the performance and reliability required by new software and operating systems. The replacement schedule also allows the Library to plan and implement any major initiatives or changes to the computing environment coinciding with the starting of a new 3-year cycle.



At the beginning of the 1999 3-year cycle, the Library's Technology Support & Development department (TS&D) identified that the current state of computing in the Library will be ready for an evolutionary change in the next cycle of replacements. The price of computers was stabilizing at around $1,200 a workstation and the West Campus population and Library usage were growing. It was estimated that additional workstations would be necessary to keep workstation utilization from reaching capacity. During this period budget cuts and reorganizations were threatening the availability of resources to allow for a 36-

month cycle replacement with the addition of more workstations. A feasibility study into alternative architectures to satisfy these new constraints and needs was commissioned.

TS&D evaluated the current state of computing in the Library, the total cost of ownership (TCO), computer industry trends and outlooks, and other resources to determine what architecture, support, and budget descriptions would provide a sustainable solution for subsequent replacement cycles. This document describes in detail the solution identified, the processes involved, and the expected outcomes of the endeavor.

Brief History of Fletcher Library Computing

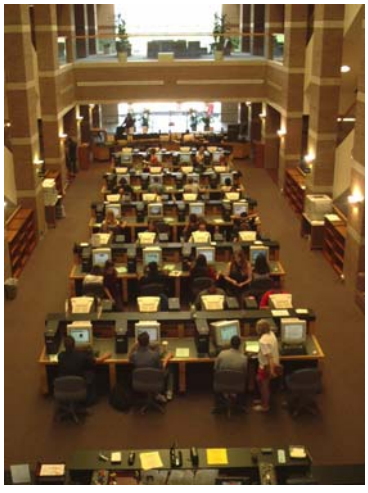
The computing environment in the Library has been constantly moving, changing, adjusting, and affecting all facets of library operations. Since the opening of Fletcher Library on campus, the computer has been an integral part of the Library's infrastructure. The numbers of machines may have been minimal in the beginning, but the necessity for their function has never diminished.

Throughout the past 10 years, the Library has performed many "firsts" in the technological arena. The Library was the first building on the West campus to have a fully operating computer network. The Library was the first on campus to have integrated a file server for staff to store and exchange work files. While the rest of the West campus was still learning how to use electronic mail effectively, in 1993 the Library had a fully-functional World Wide Web server! Users of Library services have had to endure three library catalog system vendor changes, removal of formally print products to be replaced with electronic versions, ever-changing user interfaces and search mechanisms, frequent physical movement of CDROM database locations, and terminology and jargon that comes with researching in a technology-rich library. CDROM databases started growing from just a small network of 8 workstations and standalones accessing less than 10 databases, to an intrastate network of over 200 databases available from 70 workstations within the Library and remote access from other sites on campus and from home.

The Library recognized early on that students will need to learn how to effectively use these technologies and so construction of a classroom within the Library was commissioned. The classroom facilitated use of computers for research and production through the aid of librarians teaching search methods and strategies taking advantage of computerized information.

Assessment

The Library has gathered data and generated a list of services and characteristics that should better serve its users through results analysis from the FUSS (Framing User Support Services) process. Within these proposed services is a heavy infusion of technology to meet the needs of these services. TS&D has proposed a model of service that includes the same "value-added services" criteria of Ease of Use, Fast and Convenient Delivery, and Cost Saving through a drastic change in the Library's overall computing infrastructure.



As we can see by the box on the right, the Library has observed a steady change with it's selection and use of technology.

This evolutionary path is leading and directly speaking to the "value-added" services and criteria outlined in the Library FUSS Data Report. Also, the current trend/indicator we must evaluate is the long-term cost of a computing evolution. The following simple chart below reflects indicators of computing changes and the average cost per workstation:

1992
Library hired full time support systems analyst

1993
Multimedia Macs supported by library

1994
Library classroom functional with PCs
2 additional staff hired to support development with technology – TS&D department created
Gopher server online
Total CDROM network increased to 16 stations

1995
2 student workers hired
VAX file server installed for classroom backups
Standalone CDROM titles increase in number

1996
New library on-line system
"Dumb terminals" replaced by NT-based PCs
New library file server
New database server

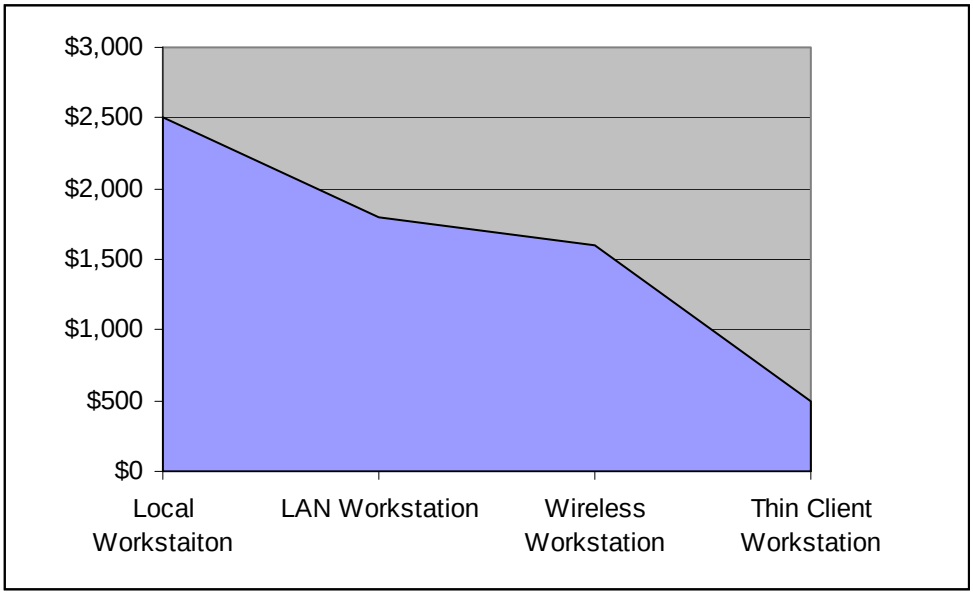
1997
2 new CDROM servers
Eliminated the VAX server
Eliminated the Gopher server
Purchased backup domain server
Purchased Indexing server
Replaced Macs with PCs on certain desktops

1998
ASU West IT covers staff computing support
Library File Services moved to IT server
Library Print services moved to IT server
Implemented automated paper monitor/tracking
Pager/cellular phones to all analysts

1999
Automated power switching in server room
24/7 Trouble Report Server operational
Automated computer use tracking
Automated Application use tracking
TS&D WWW Server online
Tape library automated backup of all servers
Automated anti-virus scanning of all clients
Replacement of Tangents with Dells

2000
Implemented "diskless" Internet workstations

2001
Library SQL server online
Network redesign for public and staff areas



In 1999, Internet appliances (embedded systems, PDAs, WebPads, Digital Web Phones, etc.) realized sales of 4.4 million devices; whereas, PC sales were at 37 million. It is estimated that by 2005 sales of Internet appliances could reach 51.8 million compared to 64.4 million PC sales.

Other indicators and data also were used in determining the environment TS&D wanted to change. One valuable set of data was the problem reports on public workstations. This data indicated that software (operating system and web browser) made up 75% of all identified problems. More specifically, the Microsoft Windows® operating system and Internet Explorer web browser were problematic and unstable. The resulting solution to these problems addresses both the base OS and web browser stability.

Public Workstation Problem Reports 2000-2001

TS&D is utilizing an automated problem report and tracking system on an internal website. The following is a summary of data covering (July 1, 2000 through June 30, 2001):

- Total Number of Problems Reported 172
- Total Number of Non-Emergency Problems Reported: 131
- Total Number of Emergency Problems Reported: 43 [25%]
- Average Analyst Emergency Callback Response Time: 9 minutes
- Problems Solved Within Standards Guidelines: 102 [59%]
- Problems Solved Within Same Day: 71 [41%]
- Number of Problems Software Related 129 [75%]

Now what do these indicators mean for the ASU West Library? They are setting the path for the next technology change in the Library. TS&D will prepare the Library's current technology infrastructure, staff, and funding to meet this new computing model.

Evolution Explained

Throughout this document, the term "evolution" is used. It is the basis of the overall project. The following list outlines the various evolution stages the Library has and will experience.

Evolution 1

Transform Library catalog access from a physical card catalog to an electronic database. The database and client access software resides on a mainframe or mini-computer. Access to the catalog is through a dumb terminal accessing a mainframe session through a terminal service.

Evolution 2

Offload computer processing resources from the mainframe to a fat-client desktop computer. Access applications reside locally on the workstation and access to resources may involve connecting to a server. These stations require a local operating system and storage device.

Evolution 3

Provide the same functionality of a fat-client (Evolution 2) while improving performance and application integrity. A change in base operating system and input/output methods keeps the total cost of ownership to a minimum while maintaining high availability and flexibility of services.

Questions to be answered

A set of questions were created for Library management to answer. The answers provide the scope and constraints for the project.

1. Will the Library public stations become ASU student production Stations? Ie. Technopolis student computing center
2. Is the web the primary means for access to electronic information?
3. Will the Library accept a situation where Windows®-only databases will have to reside on standalone Windows machines? (discontinue standalone offerings all together?)
4. Is the Library willing to commit a minimum of close to $100K to the project?
5. Can the Library commit to TS&D $10K in discretionary R&D funding for FY2001-2002?
6. Can the Library commit to TS&D $10K in training for FY2001-2002?
7. Is the Library willing to take an architectural risk outside the ASU West IT schema?
8. Does the Library really need to have expertise in ASU West IT for any endeavor?

Computing Architecture Models Examined

There are three models to address when approaching the Library's wired access service environment- Terminal Server Services, Pure Windows Services, and Web Server Services. These three designs define the overall base architecture over which both wireless and wired services would occupy. By examining each design, leveraging that includes, cost, service, longevity, and scalability become overall factors in determining the best model for the Library's future. The following describes each of the three models with their benefits and shortcomings.

Terminal Server Environment (mixed platform- ie: Linux/Mac/Windows®)

Terminal Services is a technology that lets users execute Windows®-based applications on a remote Windows® 2000-based server. In a Terminal Server-based computing environment, all application execution and data processing occur on the server. The client uses an OS proprietary application or Web browser to access the desktop interface. The client can execute Windows®- based applications and operate as if using a standard desktop computer. Services available include printing, saving to disk, and network storage access.

Pros

- Familiar operating system
- Continue using currently invested Windows®-based software
- Estimated 112 staff hours saved during scheduled updates and deployments
- Flexible with possible future ASUW IT needs
- "Change once, affect many" model
- Can operate on cheaper client hardware

Cons

- Administrative software utilities expensive
- Client/server response speed affected by number of concurrent users
- All services dependant on single piece of hardware (Terminal Server)
- Learning curve for TS&D
- Not scalable without significant increase in cost
- Somewhat expensive for total solution
- Requires Operating System Client Access Licenses (CALs)

Servers

Terminal Server	1 x $22,000
Primary Controller	1 x $3600
Backup Controller	1 x $3600
Applications Server	1 x $3600
File Services Server	1 x $3600
Security/BU Server	1 x $3600
Print Server	1 x $5600
Software	$8000

Clients

Thin-Client Terminal	86 x $500
CALs	86 x $90

Printers

No local printers	
Networked Printers	4 x $5500
	1 x $3000
Total:	**$129,340**

Human Resource Adjustments
TS&D

Terminal Server Training	2 x $3000
Reclassification of TSA to TSA Sr.	1 x $4000

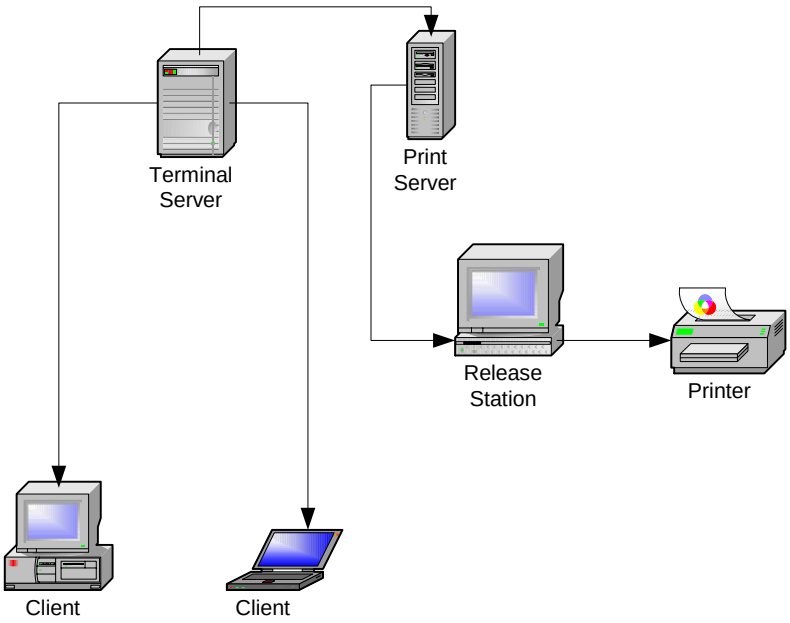


Figure 1 – Terminal Server Environment

Issues and Impacts

- Demands for additional expertise within TS&D requires additional resources
- Commits Library computing architecture to Microsoft strategies
- Currently (11/2000) 90 percent of Library electronic research is performed via a web interface. The price difference between the Terminal Server model and the Web model ($36,240) is for the remaining 10 percent of non-web activity
- When the Library network is down, the use of current III fail-over circulation software (PC-Circ) will not work. This would require an additional cost of $1600 - $6400 dollars to purchase PC workstations

Pure Windows® Environment (*current environment- single platform*)

The pure Windows® environment is what the Library currently exists in. Clients consist of desktop PCs running the Windows® operating system. Clients can execute Windows®- based applications and access file and print services. All client-side and server-side activities operate in a homogeneous environment.

Pros

- Familiar operating system
- Distributed hardware dependency
- Continue using currently invested Windows®-based software
- Scalable
- Flexible with possible future ASU West IT needs

Cons

- Requires expensive client hardware
- Administrative software utilities expensive
- Estimated 160 staff hours needed for scheduled updates and deployments
- overall high cost

Servers

Primary Controller	1 x $3600
Backup Controller	1 x $3600
Applications Server	1 x $3600
File Services Server	1 x $3600
Security/BU Server	1 x $3600
Print Server	1 x $5600

Clients

Workstation	86 x $1600

Printers

No local printers	
Networked Printers	4 x $5500
	1 x $3000

Total: $186,200

Human Resource Adjustments

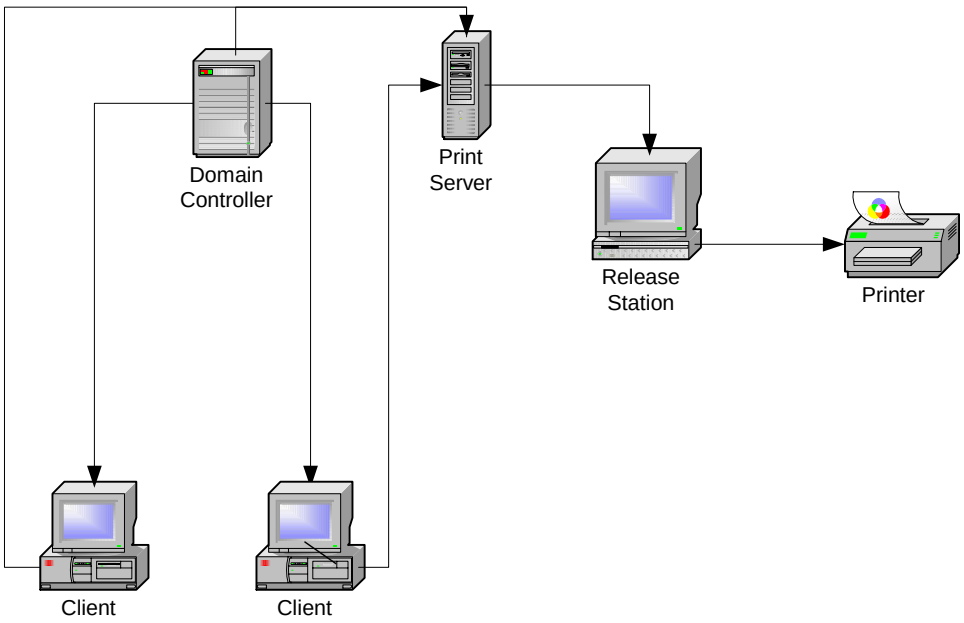


Figure 2 – Windows® Environment

Issues and Impacts

- This model would require external funding
- Commits Library computing architecture to Microsoft strategies
- Currently (11/2000) 90 percent of Library electronic research is performed via a web interface. The price difference between the Pure Windows model and the Web model ($93,100) is for the remaining 10 percent of non-web activity

Web Environment (*mixed platform- ie: Linux/Mac/Windows*®)

The Web- based environment uses the Web as the only means for accessing information and services. Clients can consist of a variety of machines and devices that are enabled for Web access. The server(s) provide content and services based on standardized Internet delivery protocols. Both client-side and server-side activities operate in a heterogeneous environment. Some Windows® applications can be used through software interpreter (WINE) if using a Linux operating system for a client.

Pros

- Highly configurable/customizable
- Low hardware and software cost
- Free administrative software utilities
- Estimated 92 staff hours saved during scheduled updates and deployments
- Single user application interface
- Scalable (easily add additional workstations and servers)
- Significant increase in client reliability/integrity
- Utilizes leading technology practices
- Provides for a lower Total Cost of Ownership/less downtime maintenance
- WYSIWYG methodology
- Minimal to no licensing restrictions
- Seamless compatibility with wireless and distributed services
- Can co-exist and share services with Windows Network Environment

Cons

- Learning curve for TS&D
- Not all Windows-based applications work through available interpreter
- May require modification to "charge for print" system
- Minimal expertise in ASU West IT

Servers

Domain Controller	1 x $3600
Boot Server	1 x $3600
Applications Server	1 x $3600
File Services Server	1 x $3600
Security/BU Server	1 x $3600
Print Server	1 x $3600
Software	$3500

Clients

Thin-Client Terminal	86 x $500

Printers

No local printers	
Networked Printers	4 x $5500
	1 x $3000
Total:	**$93,100**

Human Resource Adjustments

TS&D

OS Training	2 x $3000
Reclassification of TSA to TSA Sr.	1 x $4000
Reclassification of TSA Pr To TSA Co.	1 x $6000

Web

OS/App Training	3 x $3000

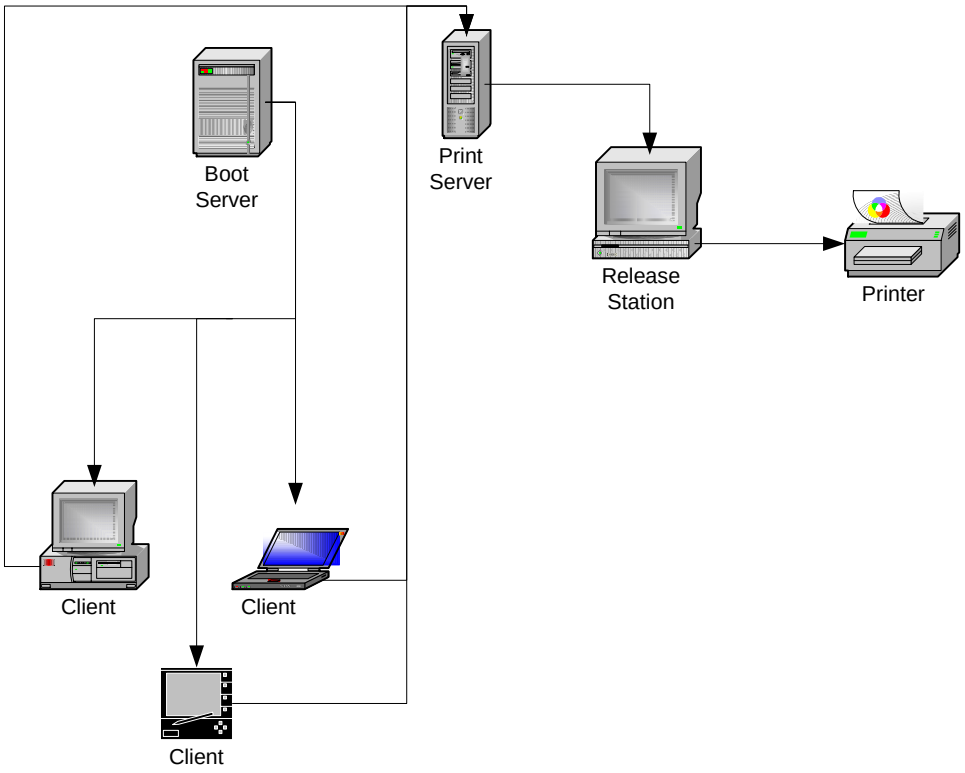


Figure 3 – Web Environment

Issues and Impacts

- Any MS Windows®-only product or service will require TS&D to test compatibility before product/service is purchased and/or offered
- Minimal impact on students due to familiarity with Internet use
- Client equipment hardware may not come with 3-year warranty but hardware failure frequency and minimal cost of replacement unit allows for nominal concern

Library Classroom Issues

Traditionally the Library Classroom has mirrored the access to resources available on the public area machines. Additional software has also been loaded to enable production capabilities from the Classroom workstations. The new Client Service Architecture model of service describes the use of alternative access devices as primary workstations. The estimated costs also reflect the use of alternative (less expensive) access devices.

The following outlines issues for consideration when addressing the overall new model of service.

Terminal Server Environment

The Terminal Server Environment allows for the use of alternative access devices that can be deployed in the Library Classroom. No additional or adjusted cost needs to be made to this model.

Pure Windows® Environment

The Pure Windows® Environment model describes the access in the Library Classroom as being the same as in the past. No additional or adjusted cost needs to be made to this model.

Web Environment

The Web Environment model allows for the use of alternative access devices deployed Library-wide (including the Classroom.) Although this model allows for the use of traditional (Windows®) computers, the client and support hardware/software costs increase. Traditional Windows®-based computers as access stations in the Library Classroom would add an estimated $40,000 additional cost and 24 work-hours to the Web Environment model. This brings the overall total cost to $133,100.

Cost Savings

Industrial cost of device and component production is systematically getting cheaper. By further reducing the need of key components (desktop monitor, large hard drive for operating system and applications, high-end video, etc.) the cost of an access device decreases. The service/resource shift from client to server does not indicate a one-for-one cost absorption ratio. Rather, the price of a traditional workstation, when offset by a reduced cost access device, may create a cost surplus that could be reallocated towards server costs. Thus subsidizing current server funding with cost savings will put a minimal strain on current library technology funding trends. The current average annual funding amount for technology support devices in the Library is $90k. This funding might need to increase by as much as twelve percent per annum to reflect development and improvement efforts.

Human resource cost savings is reflected in the physical overhead of maintaining and upgrading client workstations. The new models of service decreases the resource time traditionally invested in deploying operating system and application updates, new applications, and new equipment images. The savings in human resource time can then be reallocated to development and improvement efforts.

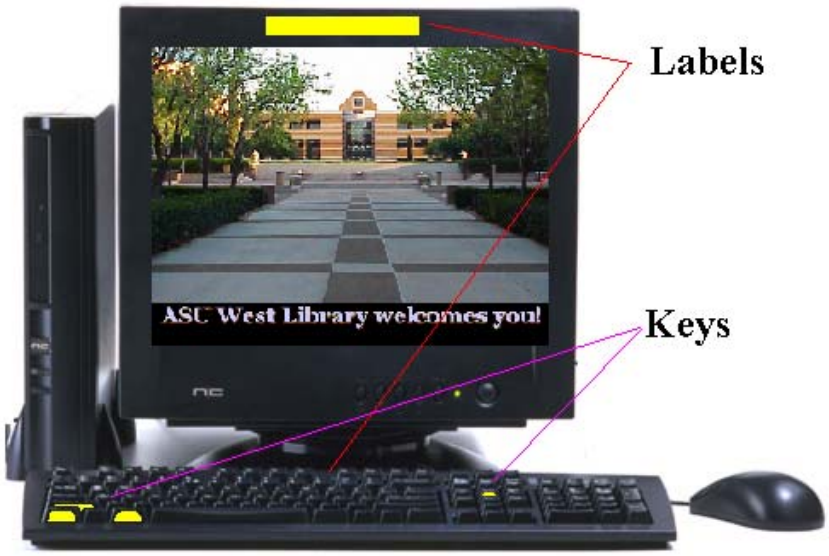
Recommendation

The Web Environment model provides the greatest flexibility in application services while containing costs. The reliability and ease of deployment will provide relief to support staff in deployment and updates of equipment and services. The cost savings would be realized through the reduction of current incremental fiscal requirements for higher-priced and underutilized equipment replacements and FTE overhead. TS&D recommends the Web Environment Model.

Network Computer Project

The Network Computer Project was proposed in 2000 for the purpose of evaluating an alternative client access station which included a non-Microsoft operating system and web browser. The secondary purpose of the project was to see if the total cost per workstation could come in under $500 dollars per unit. Both purposes met with success with a couple caveats. Although there were not any reported problems or concerns from users of the Internet workstations, hardware failures have limited the longevity of continuing to provide these alternative access stations.

Below illustrates the ease in setting up access by using a keystroke combination to start the browser process:



Like any new product to market, the ThinkNIC was the first successful Internet Appliance to emerge out of prototype. TS&D was not looking for a particular brand or product solution for long-term mass deployment. We were more interested in answering the following:

- Can we utilize a non-Microsoft operating system?
- Can we provide similar services that the customer has been used to on Windows® machines?
- Can we provide an access station that has better security and integrity than a traditional Windows solution?
- Can the total solution cost less than $500 dollars per unit?
- Can the user base accept an alternative station?

The results of the project have answered “yes” to all of the above questions. The longer term implications of this project were in identifying a stable access workstation for mass deployment, establishing a support system for a non-Microsoft environment, provide both hardcopy and magnetic output options, and create a public education program when the conversion project starts.

Decision Meeting and Discussion Capsule

The road from the 1999 proposal to the 2002 decision for E3 has been a bumpy road. As technology breakthroughs occurred and pricing strategies changed, TS&D had to undertake daily updating and reassessment on the specifics of the proposal. Three identifiable groups of Library staff had to be addressed in distinctly unique ways in order for the Library as a whole to buy into the proposal. The overall time invested in discussion meetings was well over 40 hours.

Management

Library senior management was concerned with resource cost and utilization. This group makes fiscal and strategic decisions for the Library. TS&D had to focus on cost containment, building space planning, network topology, current and new staff position descriptions and assignments, timeline, and risk management in presenting and discussing the proposal.

Librarians

The majority of librarians were concerned with the impacts to Library users. What will the new interface look like? What new services will our users have to loose or compromise? These questions presented the most difficulty to answer. TS&D was presenting an architectural change and strategy for the means by which services would be delivered. What services would be available and what they would look and feel like was purely speculative. A guarantee had to be offered that the disruption in services would be as minimal as any regular 3-year replacement rollout. Another guarantee was the core services currently offered would continue in the new model. Some librarians were concerned with the quality and reliability in the access hardware. By not selecting a name-brand computer like Dell for a computer workstation seemed to raise some concern. Efforts were made by TS&D to ease these concerns by citing the selection of quality components and assembly practices will improve the state of the workstations over previously purchased name-brand computers. TS&D further stated the additional cost of $100 to $150 per workstation for warranty service support previously purchased with new Library workstations was used on less than 5% of all encumbered machines over a 3-year cycle. TS&D could perform its own warranty service support with existing staff and save the additional per unit cost. Additionally, having a small parts inventory containing extra components from the initial workstation purchase would actually decrease the turnaround time for repair service.

Library Support Staff

Support staff were the easiest group to buy into the new model. They expressed the need for cost containment and understood the goals of the plan. They voiced their experience with ever-changing technology and interfaces citing various online catalog enhancements and vendor changes. This group was satisfied with the recommended model and looks forward to it being realized.

TS&D

TS&D has expressed at various levels within the Library organization it's need for innovation. The TS&D staff wants to partake in adding value to the Library. The E3

proposal has energized the department and allows for creativity and innovation where before there was maintenance and service support only. The addition of utilizing open source software and the community of resources available has stimulated the department into finding creative uses of its technology resources where previously there were major limitations and constraints.

Project Charter

Business Problem

Long-term Library technology support funding is not stable. Software licensing costs and new hardware costs continue to rise due to pricing or quantity. The Library can not continue to sustain its technology infrastructure using its current architecture. Nor can the Library take full advantage of its technology resources using the current architecture.

Statement of Work

Develop and implement a new computing architectural model that will be sustainable over the long-term and facilitate creative developments to meet business goals.

Project Objectives

- Migrate both client workstations and servers from Microsoft Windows to Linux
- Develop a user workstation experience that contributes to individual goals
- Reduce TCO
- Develop a foundation for long-term technology infrastructure planning
- Provide a long-term technology funding strategy

Success Factors

- End-user workstations provide core Library resource services
- TCO reduced compared to previous technology fiscal cycles
- Diskless workstation environment improves reliability and performance

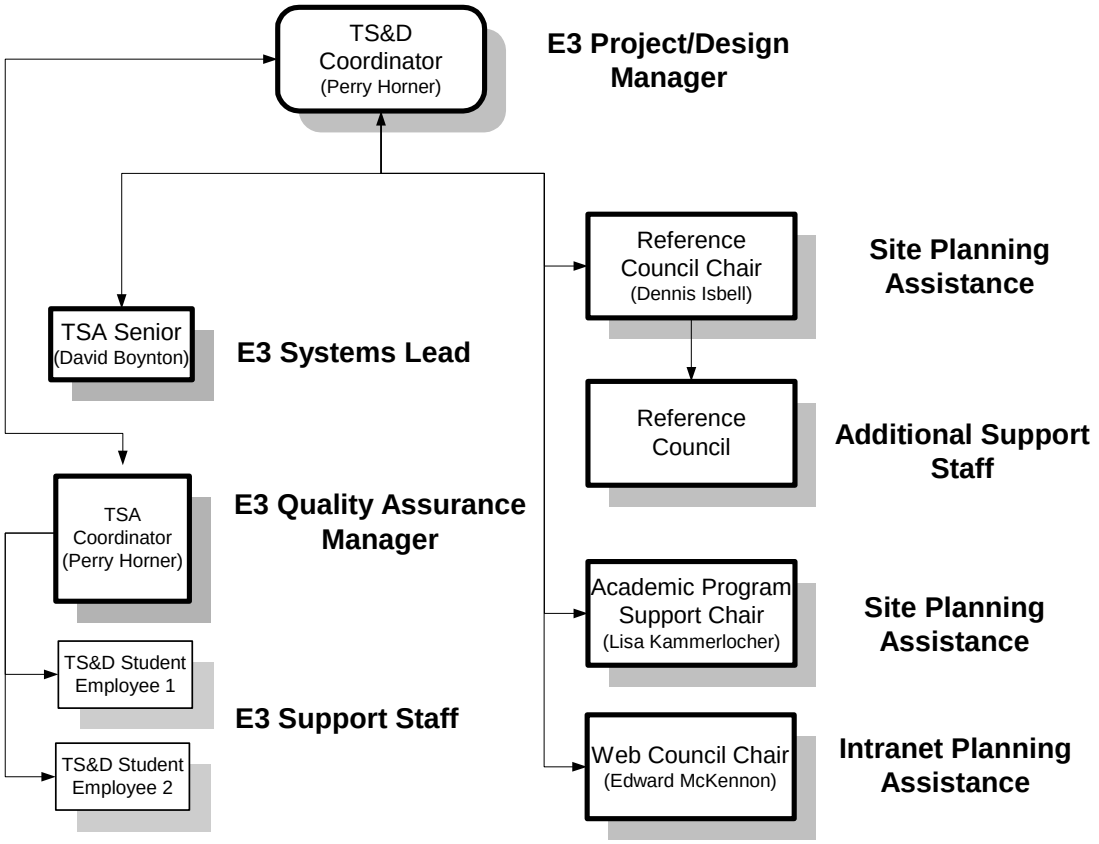
Project Dependencies/Constraints

- Requires dedicated network segment
- Library is the sole end-to-end support provider for equipment and software

Project Organization

[*See* Project Organization Chart]

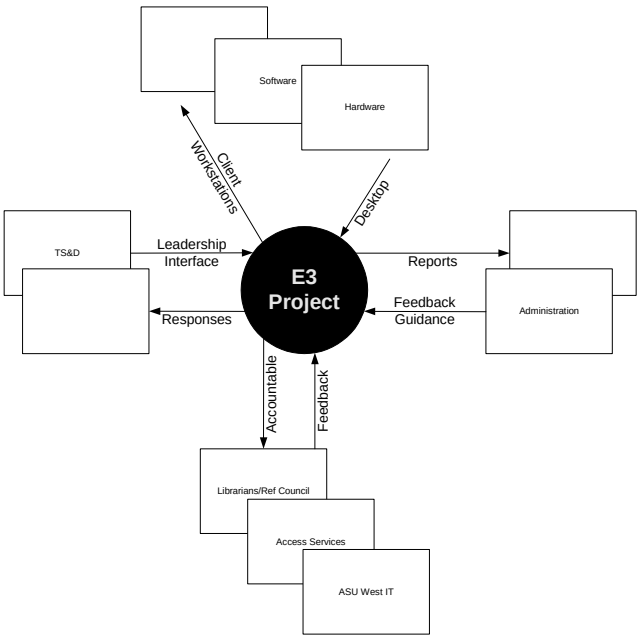
Project Organization Chart



Resource Loading Profile

Each TS&D staff member has a set percentage commitment to the success of the E3 project. The following reflects the load allocation for each person.

TS&D TSA Coordinator	80%
TS&D TSA Senior	80%
TS&D Student Employees	50%



External Project Interfaces

Scope Creep

Scope creep occurs when a project continues to grow after the project design phase has been completed. In the end, the project includes more work and components than what was originally designed and agreed upon. The E3 project shall be executed in a way which any change must have it's scope challenged. The easiest way to challenge a requested change to the project is to answer the following questions:

- Does the change add benefit to the already identified project outcome?
- Does the change NOT require additional resources?
- Does the change NOT adversely affect the project timeline?
- Does the change NOT have contingent requirements?

If the answer to the above questions is "yes", then the change probably will not affect the primary scope of the project and can then be explored using the Change Control Worksheet. Otherwise, the change probably would introduce scope creep and jeopardize the project.

Change Control Process

To aid in the change request process, the requestor must submit to the Project Manager a Change Request Form. This form includes questions, estimations, and criteria that must be supplied by the requestor to be considered by the Project Manager and Project Team. The Project Manager and Project Team then will analyze the Change Request and transfer certain elements of the request into a Change Control Review Worksheet. This worksheet provides summation to the request and weights and values to pertinent areas.

Change Control Review Worksheet

Criteria	Maximum Value	Score
Does the request support the project objectives (on scope)	**15**	
Is the requested impact on the project budget less than 5%	30	
Does the request require less than 10% of the total project time	30	
Does the request involve NO additional stakeholders	5	
Does the request require NO new expertise	20	

If the Change Control Review Worksheet scores 80 or above, then the request should be granted by the Project Manager. The weights of the score values are speculative and are reflective of the Project Team's knowledge and expertise with the objectives and the value the request brings to the project.

Implementing Change

A change request that has been granted now must be integrated into the current project. The Project Manager will address the tasks involved, resources necessary, and adjust the schedule where necessary. A change needs to be documented as a change within the project. This could be used as a pivotal milestone when assessing the outcomes/results of the project deliverable. The Project Manager must also include any additional Risk Assessment and Contingency plans with the change.

Future Projects

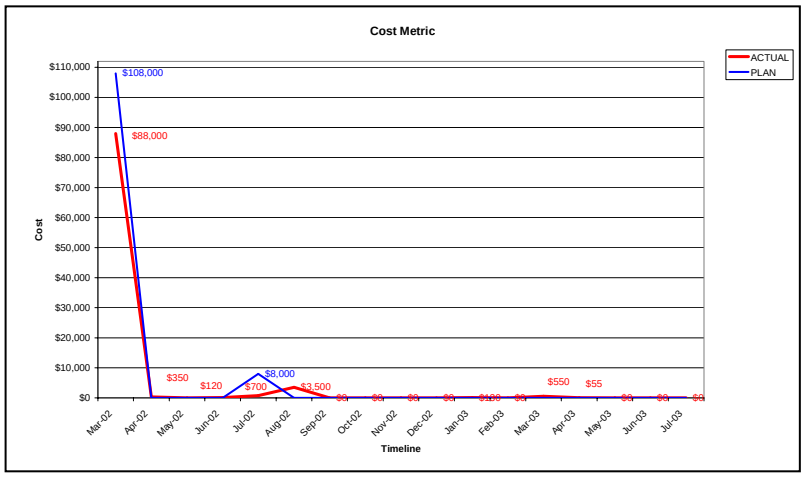
A change that had been rejected may still be applicable if addressed in a new project request. The original project could be labeled as Phase 1 and any new changes to the deliverable can be developed into a Phase 2 project. This allows a new set of objectives and scope to be identified which could include the change. A rejected change could also be considered as a TQM agenda item.

Metrics

TS&D will perform metric measurements for the E3 project using the factors of cost and complexity to measure progress over time. A successful project is the sum of Plans + Budget + Schedule + Workforce. These metrics will be periodically tested by the Project Manager to verify and validate the project requirements are being met and to take corrective action.

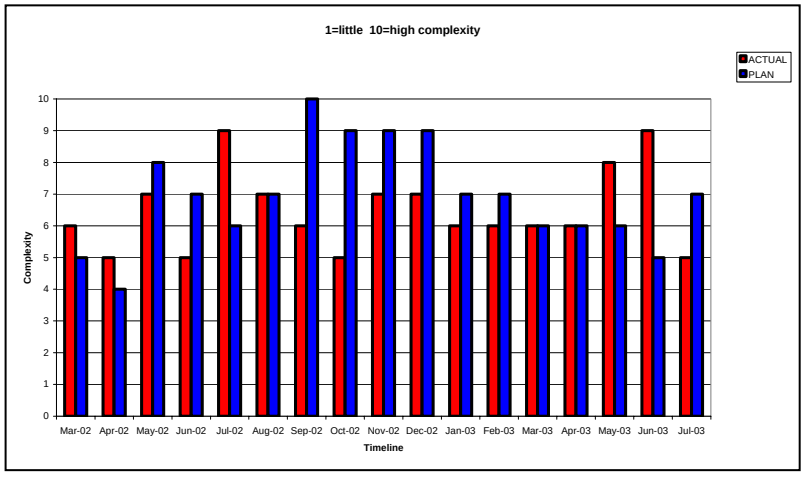
• Cost Metric

The cost metric aids in identifying problem areas. The project should not have any additional costs beyond what was outlined in the project proposal. When costs near the break-even point, the Project Manager will realign resources to maintain cost savings.



• Complexity

The complexity metric aids in identifying workforce needs and it's affect on the project timeline. If the complexity is great for a task, then additional resources may be necessary or the timeline adjusted to ensure that complexity does not interfere with task completion.



Milestones

There are four milestones in the E3 project. Each identifies progress completion in a specific area. These milestones use the identifier Phase and are denoted with numbers one through four.

- Phase 1: Specification and Procurement
- Phase 2: Infrastructure Operating in a Tandem Environment
- Phase 3: Migration of Back-Office Server Infrastructure
- Phase 4: Migration of Public Machines to New Environment

Tailored Project Measurement

The E3 project uses a measurement tailoring process to define measures that provide the greatest insight into E3 issues at the lowest cost. These issues can be bumps in the road or actual roadblocks to achievement of project objectives. The Project Manager will be responsible for the following to aid in meeting objectives:

- Identification and prioritization of project-specific issues
- Selection of appropriate measures to address the project-specific issues
- Integration of the measures into the process
- Ensuring that everyone involved in the E3 project understands the capabilities and limitations of the measures
- Ensuring that only required measures are implemented based on the issues and objectives of the E3 project
- Making the measurement data available to stakeholders

Library Evolution 3 Project Task Sheet

Start Date: Mon 3-18-02 / Finish Date: Mon 7-7-03

ID	Task Name	Work	Duration	Start	Finish	% Work Complete	Resource_Names
1	**Specification**	80 hrs	5 days	Mon 3/18/02	Fri 3/22/02	0%	
2	create requirements	16 hrs	2 days	Mon 3/18/02	Tue 3/19/02	0%	TSA Coord.
3	**identify HW and SW**	16 hrs	1 day	Tue 3/19/02	Tue 3/19/02	0%	
4	verify compatibility	8 hrs	1 day	Tue 3/19/02	Tue 3/19/02	0%	TSA Coord.
5	reviews & lab reports	8 hrs	1 day	Tue 3/19/02	Tue 3/19/02	0%	TSA Coord.
6	Testing	48 hrs	3 days	Wed 3/20/02	Fri 3/22/02	0%	TSA Coord.,TSA Sr.
7	**Purchasing**	128 hrs	9.5 days	Mon 3/25/02	Fri 4/5/02	0%	
8	**Identify vendors**	48 hrs	1 day	Mon 3/25/02	Mon 3/25/02	0%	
9	check supply chain	16 hrs	1 day	Mon 3/25/02	Mon 3/25/02	0%	TSA Coord.,Business Manager
10	check user feedback	16 hrs	1 day	Mon 3/25/02	Mon 3/25/02	0%	TSA Coord.,Business Manager
11	check BBB and consumer reports	16 hrs	1 day	Mon 3/25/02	Mon 3/25/02	0%	TSA Coord.,Business Manager
12	create order list	8 hrs	4 hrs	Mon 3/25/02	Mon 3/25/02	0%	TSA Coord.,Business Manager
13	place orders	72 hrs	9 days	Mon 3/25/02	Fri 4/5/02	0%	Business Manager
14	**Receiving**	1,288 hrs	40 days	Mon 4/8/02	Fri 5/31/02	0%	
15	identify storage facilities	6 hrs	2 hrs	Mon 4/8/02	Mon 4/8/02	0%	TSA Coord.,TSD SW 1,TSD SW 2
16	create receiving proceedures	2 hrs	2 hrs	Mon 4/8/02	Mon 4/8/02	0%	TSA Coord.
17	receive and store	1,280 hrs	40 days	Mon 4/8/02	Fri 5/31/02	0%	TSA Coord.,TSA Sr.,TSD SW 1,TSD SW 2
18	**End of Phase 1**	0 hrs	0 days	Fri 5/31/02	Fri 5/31/02	0%	
19	**TS&D department migration**	368 hrs	14 days	Tue 4/9/02	Fri 4/26/02	0%	
20	install removable HD trays	128 hrs	4 days	Tue 4/9/02	Fri 4/12/02	0%	TSA Coord.,TSA Sr.,TSD SW 1,TSD SW 2
21	install Linux on all staff machines	160 hrs	5 days	Mon 4/15/02	Fri 4/19/02	0%	TSA Coord.,TSA Sr.,TSD SW 1,TSD SW 2
22	install office applications	80 hrs	5 days	Mon 4/22/02	Fri 4/26/02	0%	TSA Coord.,TSA Sr.
23	**UniPRINT solution**	160 hrs	20 days	Mon 4/15/02	Fri 5/10/02	0%	
24	test various daemons	160 hrs	20 days	Mon 4/15/02	Fri 5/10/02	0%	TSA Sr.
25	**III Print Server**	26 hrs	3.25 days	Tue 5/14/02	Fri 5/17/02	0%	
26	install new JetDirect	2 hrs	2 hrs	Tue 5/14/02	Tue 5/14/02	0%	TSA Sr.
27	Coordinate IP change	24 hrs	3 days	Tue 5/14/02	Fri 5/17/02	0%	TSA Sr.
28	End of Misc	0 hrs	0 days	Fri 5/17/02	Fri 5/17/02	0%	
29	**PDC migration**	16 hrs	2 days	Mon 5/20/02	Tue 5/21/02	0%	
30	build new server	16 hrs	2 days	Mon 5/20/02	Tue 5/21/02	0%	TSA Sr.
31	**Deployment Server**	34 hrs	4.25 days	Mon 5/6/02	Fri 5/10/02	0%	
32	freshen server	8 hrs	1 day	Mon 5/6/02	Mon 5/6/02	0%	TSA Sr.
33	install DeployCenter 5.0	2 hrs	2 hrs	Tue 5/7/02	Tue 5/7/02	0%	TSA Sr.
34	test	24 hrs	3 days	Tue 5/7/02	Fri 5/10/02	0%	TSA Sr.
35	**Circulation Stations**	124 hrs	9 days	Mon 5/13/02	Thu 5/23/02	0%	
36	assemble	16 hrs	1 day	Mon 5/13/02	Mon 5/13/02	0%	TSA Coord.,TSA Sr.
37	install OS and SW (Windows)	16 hrs	1 day	Tue 5/14/02	Tue 5/14/02	0%	TSA Coord.,TSA Sr.
38	test	16 hrs	1 day	Wed 5/15/02	Wed 5/15/02	0%	TSA Coord.,TSA Sr.
39	create image	4 hrs	2 hrs	Wed 5/15/02	Wed 5/15/02	0%	TSA Coord.,TSA Sr.
40	deploy	24 hrs	1 day	Wed 5/15/02	Thu 5/16/02	0%	TSA Coord.,TSD SW 1,TSD SW 2
41	store old machines	16 hrs	1 day	Thu 5/16/02	Thu 5/16/02	0%	TSD SW 1,TSD SW 2
42	create Linux image	16 hrs	1 day	Wed 5/22/02	Wed 5/22/02	0%	TSA Coord.,TSA Sr.
43	test III java client on Linux	16 hrs	1 day	Thu 5/23/02	Thu 5/23/02	0%	TSA Coord.,TSA Sr.
44	**Classroom Stations**	172 hrs	29 days	Mon 5/13/02	Thu 6/20/02	0%	
45	assemble	80 hrs	5 days	Mon 6/10/02	Fri 6/14/02	0%	TSD SW 1,TSD SW 2
46	install OS and SW (Windows)	16 hrs	1 day	Mon 6/17/02	Mon 6/17/02	0%	TSA Coord.,TSA Sr.
47	test	16 hrs	1 day	Tue 6/18/02	Tue 6/18/02	0%	TSA Coord.,TSA Sr.
48	create image	4 hrs	2 hrs	Tue 6/18/02	Tue 6/18/02	0%	TSA Coord.,TSA Sr.

49	deploy	24 hrs	1 day	Tue 6/18/02	Wed 6/19/02	0%	TSD SW 1,TSD SW 2,TSA Coord.
50	store old machines	32 hrs	2 days	Wed 6/19/02	Thu 6/20/02	0%	TSD SW 1,TSD SW 2
51	**End of Phase 2**	0 hrs	0 days	Thu 6/20/02	Thu 6/20/02	0%	
52	**Library Intranet Server [WLIBNET]**	304.5 hrs	27 days	Thu 6/20/02	Fri 7/26/02	0%	
53	assemble	32 hrs	4 days	Thu 6/20/02	Tue 6/25/02	0%	TSA Sr.
54	install OS and SW (Windows)	24 hrs	3 days	Wed 6/26/02	Fri 6/28/02	0%	TSA Sr.
55	migrate	80 hrs	5 days	Mon 7/8/02	Fri 7/12/02	0%	TSA Sr.,WC Chair
56	test	80 hrs	5 days	Mon 7/15/02	Fri 7/19/02	0%	TSA Sr.,WC Chair
57	join to ASUWEST domain	0.5 hrs	30 mins	Wed 7/17/02	Wed 7/17/02	0%	TSA Sr.
58	establish trust	8 hrs	1 day	Wed 7/17/02	Wed 7/17/02	0%	TSA Sr.
59	establish ASUW backup schedule	80 hrs	5 days	Mon 7/22/02	Fri 7/26/02	0%	TSA Sr.,WC Chair
60	**Database Server [WLIBDB]**	144 hrs	10 days	Mon 6/3/02	Fri 6/14/02	0%	
61	assemble	16 hrs	2 days	Mon 6/3/02	Tue 6/4/02	0%	TSA Coord.
62	install OS and SW [Linux]	32 hrs	2 days	Wed 6/5/02	Thu 6/6/02	0%	TSA Coord.,TSA Sr.
63	create inventory DB	32 hrs	2 days	Fri 6/7/02	Mon 6/10/02	0%	TSA Coord.,TSA Sr.
64	integrate barcode scanner	64 hrs	4 days	Tue 6/11/02	Fri 6/14/02	0%	TSA Coord.,TSA Sr.
65	**Project Server [WLIBINFO]**	160 hrs	13 days	Wed 5/15/02	Fri 5/31/02	0%	
66	assign domain name	8 hrs	1 day	Wed 5/15/02	Wed 5/15/02	0%	TSA Sr.
67	assemble old machine	32 hrs	4 days	Wed 5/15/02	Mon 5/20/02	0%	TSA Sr.
68	install OS and SW [Linux]	24 hrs	3 days	Tue 5/21/02	Thu 5/23/02	0%	TSA Sr.
69	create project website	48 hrs	3 days	Fri 5/24/02	Tue 5/28/02	0%	TSA Coord.,TSA Sr.
70	create usergroup website	48 hrs	3 days	Wed 5/29/02	Fri 5/31/02	0%	TSA Coord.,TSA Sr.
71	**Backup Server [WLIBBACK]**	120 hrs	15 days?	Mon 8/5/02	Fri 8/23/02	0%	
72	assign domain name	8 hrs	1 day	Mon 8/5/02	Mon 8/5/02	0%	TSA Sr.
73	assemble old machine	32 hrs	4 days	Tue 8/6/02	Fri 8/9/02	0%	TSA Sr.
74	install OS and SW [Linux]	40 hrs	5 days	Mon 8/12/02	Fri 8/16/02	0%	TSA Sr.
75	create backup schedule	40 hrs	5 days?	Mon 8/19/02	Fri 8/23/02	0%	TSA Sr.
76	**TS&D File Server [WLIBFILE]**	80 hrs	5 days	Mon 9/9/02	Fri 9/13/02	0%	
77	install OS and SW [Linux]	80 hrs	5 days	Mon 9/9/02	Fri 9/13/02	0%	TSA Coord.,TSA Sr.
78	**Security Server [WLIBSEC]**	160 hrs	10 days	Mon 9/16/02	Fri 9/27/02	0%	
79	install OS and SW [Linux]	160 hrs	10 days	Mon 9/16/02	Fri 9/27/02	0%	TSA Coord.,TSA Sr.
80	**Boot Server 1 & 2 [WLIBBOOTx]**	944 hrs	59 days	Tue 10/1/02	Fri 12/20/02	0%	
81	install OS and SW [Linux]	944 hrs	59 days	Tue 10/1/02	Fri 12/20/02	0%	TSA Coord.,TSA Sr.
82	**Report and Info Server [WLIBTRIS]**	1,600 hrs	100 days	Mon 8/5/02	Fri 12/20/02	0%	
83	install OS and SW [Linux]	1,600 hrs	100 days	Mon 8/5/02	Fri 12/20/02	0%	TSA Coord.,TSA Sr.
84	**End of Phase 3**	0 hrs	0 days	Fri 12/20/02	Fri 12/20/02	0%	
85	**PAC Machines**	1,768 hrs	280 days	Mon 5/20/02	Fri 6/13/03	0%	
86	assemble	160 hrs	10 days	Mon 5/20/02	Fri 5/31/02	0%	TSD SW 1,TSD SW 2
87	install OS and SW [Linux]	80 hrs	5 days	Mon 1/6/03	Fri 1/10/03	0%	TSA Coord.,TSA Sr.
88	test	1,248 hrs	78 days	Mon 1/13/03	Wed 4/30/03	0%	TSA Coord.,TSA Sr.
89	create boot image	48 hrs	3 days	Mon 5/5/03	Wed 5/7/03	0%	TSA Coord.,TSA Sr.
90	install image to boot server	32 hrs	2 days	Thu 5/8/03	Fri 5/9/03	0%	TSA Coord.,TSA Sr.
91	test	80 hrs	5 days	Mon 5/12/03	Fri 5/16/03	0%	TSA Coord.,TSA Sr.
92	deploy	120 hrs	5 days	Mon 6/9/03	Fri 6/13/03	0%	TSD SW 1,TSD SW 2,TSA Coord.
93	**End of Phase 4**	0 hrs	0 days	Mon 7/7/03	Mon 7/7/03	0%	
94	**Library Web site [WWWx]**	16 hrs	1 day	Mon 7/7/03	Mon 7/7/03	0%	
95	***Start new project***	***16 hrs***	***1 day***	***Mon 7/7/03***	***Mon 7/7/03***	***0%***	***TSA Coord.,TSA Sr.***

Total Cost of Ownership (TCO)

Total Cost of Ownership for technology was mainly developed by the Gartner Group as a tool for measuring the true cost of technology within an organization. TS&D uses a simplified formula for TCO:

```
TCO=  Equipment
      +Staffing
      +Incidentals
      +Training
```

- Equipment
  Equipment includes the cost of purchasing all necessary software, licenses, and hardware.

- Staffing
  Staffing includes all hourly and salary costs associated with staffing the support of the item.

- Incidentals
  Incidentals include peripherals, replacements, and supply costs for maintaining the item.

- Training
  Training includes formal training, reading materials, conferences, etc. in support of the item.

Old Design	**Year-1 non-depreciated**
FT Staff	$174,000.00
Student Staff	$26,000.00
Workstations	$145,600.00
Servers	$36,000.00
Software	$8,790.00
Peripherals/Supplies	$1,500.00
Support Material	$1,200.00
Troubleshooting cost	$36,000.00
TCO	$357,090.00
New Design	
FT Staff	$126,000.00
Student Staff	$20,800.00
Workstations	$51,140.00
Servers	$31,717.00
Software	$850.00
Peripherals/Supplies	$1,500.00
Support Material	$1,200.00
Troubleshooting cost	$11,010.00
TCO	$222,197.00
TCO OLD - per unit	$2,975.75
TCO NEW - per unit	$1,851.64
Savings per unit	**$1124.11**
Total Savings	**$134,893.00**

The TCO savings assumes staff are dedicated solely to the item measured. This really is not the case and therefore realized savings is actually higher. It is also assumed that Incidentals will not be equal between the two TCO design models. Since TS&D has control over the quality of parts and workmanship in the second model, the second model may also have an additional lowering of TCO.

Challenges

The following lists challenges faced and the steps taken towards a solution.

Pharos UniPrint

The increasing cost of supporting printing in the Library has initiated the investigation into a managed printing solution. Currently ASU employs a print management solution provided by Pharos called UniPrint. The trick for TS&D is to find a way to seamlessly implement the ability to take advantage of this system. Through much trial and error, a solution has been identified where E3 client stations can print to the UniPrint system and retrieve their output using the same steps an MS Windows system would. The Library can continue to provide in-house paper output but now utilize the ASU managed print solution.

PDC/BDC

To facilitate the first leg of the E3 project in migrating back-office servers to Linux, TS&D needed to ensure the current install base of MS Windows clients will behave normally and thus, providing a seamless changeover. The clients will need to continue to exist using their current image and methods of operation until they are converted over to the new Linux system. This requires TS&D to create a replacement SMB-based domain for these clients to exist in. The solution is to use SAMBA version 3.0 loaded on a Linux server to act as a domain controller. All current user accounts, profiles, and policies can be moved to the SAMBA server. The additional component necessary to sustain a domain controller is to have a backup domain controller. This is accomplished by creating another SAMBA server and have key files and directories replicated from the primary domain controller. Unfortunately, after rollout, the solution broke down during mandatory profile serving. Dropouts occurred and inconsistent connectivity was reported. TS&D reverted back to its old domain model and will remain in that model until the end of the E3 project at which the need for an SMB domain will not be necessary.

III Circ Java Client

Innovative Interfaces Inc. uses a Java-based client for access to the Circulation Module. III currently only distributes the jar files and installer for MS Windows operating systems. Since the client uses Sun Microsystem's Java Runtime Environment to execute the jar files, theoretically, the Circulation Module client should run on any platform which allows JRE applications. TS&D tested this theory by setting up a Linux-based client, loading the Linux version of the JRE, and copying over the jar files from a MS Windows machine that currently had the III client already installed. The results were promising. The Circulation Module looked and behaved almost exactly the same as it's MS Windows equivalent. This test was necessary to confirm or deny the option of implementing Linux-based circulation clients in the future. III might release a Linux RPM-based installer in the near future which will ease the implementation.

Automatic Morning Startup

Control of power has been an objective for TS&D within the E3 design. The Library needs a way to power up and down workstations, preferably using an easily re-

programmable schedule. This has been accomplished by using network interface cards and motherboards that support the Wake-On-LAN feature from Intel's Wired for Management specifications. By using a database of asset MAC addresses for each workstation, coupled with server schedule entries and scripts, the server can send a wakeup signal to a specific client workstation. The server also can insert a scheduled item into the remote client schedule system. This item can designate the time to execute a shutdown/poweroff command.

Linux Server File Access

The E3 design for servers uses separate strong-password and accounts stored locally on each server. To minimize security risks, a method for server file, directory, and console access needed to be identified. TS&D is using Secure Shell (SSH) as the means for remote access to servers. In addition, off-site access is further secured by using a VPN to each server.

Staffing for the New Environment

Since E3 reflects a drastic operational and environmental change, technology staff utilization and capacity had to be analyzed. It has been discovered that the old model design required a full-time tech to support the servicing, management, updates, and replacements of public computing hardware and software. The new E3 environment virtually eliminates the overhead that makes the tech necessary. All machines do not require any local image loading; this is automated. All machines do not have a third party warranty service contract. All servicing is performed in-house using inventoried parts. All functions that previously required high technical expertise in the deployment and upkeep of a traditional fat-client have been reduced to the level where a student employee can perform the service. Administrative records keeping the tech performed has been delegated to Library Administration where there is less risk of information redundancy, and less risk for error. Staffing required by E3 needs extremely knowledgeable personnel who have a clear understanding of enterprise system integration, computer programming, computing theory, industry happenings, and project management. In addition, the staff must be flexible to fulfill a "Jack of all trades" role in systems support, yet have primary attention to the components that make up E3. The E3 design using Linux reduces the day-to-day staff involvement performing software fixes and maintenance. The result has been a reduction of one fulltime staff person and a realignment of the remaining two full-time positions.

ATA Hardware RAID 5 on Linux

ATA RAID is a challenge under Linux. Linux supports software RAID from the kernel. However, hardware RAID requires either unusual setup procedures and/or custom drivers. RAID using SCSI hard drives has been common for many years. The cost of SCSI drives is higher than ATA IDE drives. The benefit in using SCSI drives comes with the constant throughput exchange. The use of IDE drives in a RAID array is beneficial if the cost needs to remain low and the constant throughput requirements are not necessary. The Library does not need maximum throughput, nor a constant data rate for its servers. Therefore, ATA RAID is the identified solution. This solution created a challenge for TS&D. TS&D created custom installation procedures for RAID 1 as well

as a custom compiled driver for RAID 5 installations. At the end of three weeks, a stable method of implementing RAID 1 and RAID 5 on all servers had been created. Upon further OS updates, it became apparent that the custom driver method for the RAID cards is not conducive for our rapid support environment. TS&D decided to replace all Promise SX6000 RAID cards with proven 3Ware Escalade RAID 5 cards. The result was a stable hardware RAID without any need to modify, nor rebuild the kernel.

Client Memory Management

Because the client workstations do not have a hard drive, all files for the workstation exists in RAM. All workstations have 1 gigabyte of DRAM storage. The Linux operating system can exist comfortably within a RAMdisk of this size. Where the challenge occurs is in the application sets loaded and their memory utilization. To enable a desktop interface over the X graphics server, we loaded KDE (K Desktop Environment) for our user interface. We enabled four virtual desktops and applied a custom theme and style for the GUI. To keep an application from using up all available RAM, a disk quota monitor checks to see if there is enough memory to execute an application. Too little memory and the application will not load. The Web browser has been locked so that there is not any local caching of files (a Web caching server will be addressed in a different project), nor displaying of pop-up ads. The temporary storage RAMdisk partition is set to a manageable size to allow for temporary storage but not affect the overall system resource needs. All unnecessary operating system files have been removed from the served RAMdisk image. When a user logs out from the workstation, a cleanup process takes place freshening available memory. The X server also had to be configured so that it will not crash in the event of 100% memory utilization. We do not expect any incidents of total memory usage. All applications run compactly using 100K to 12MB of memory.

Printing and Saving Documents

It became apparent early on after deploying the new workstations that users were not able to print or save various document types they were viewing. One issue had to do with the behavior of the Blackboard Portal Server sending MIME document types as an application type and not a document type. TS&D manually coded Mozilla to recognize the dot-3 extensions instead of the MIME type in order for the appropriate reader application to launch. Printing using the Microsoft document readers rendered blank pages. This was an issue in the way WINE interfaced with the CUPS print subsystem. TS&D was able to fix this problem. Printing from Adobe Acrobat presented us with the toughest problem. Using the Native Linux Adobe Acrobat Reader, users were not able to print to a PS Level 3 printer. Using the Adobe Acrobat Reader under WINE the user was not able to print an entire document- last page would not print, or if it was a single page document, no pages printed. In addition, if a user selected “find” to search for a text pattern, the application would immediately terminate. TS&D was not impressed with the performance, nor the stability of the Adobe Reader and thus, looked into the use of alternative viewers- KGhostScript, GhostView, and xPDF. Ultimately, xPDF was identified as an appropriate replacement for Adobe Reader. Since saving of a PDF document through both the Linux version of Acrobat and xPDF presented the user with the Linux filesystem directory structure and did not set a default filename, an easier

filesystem dialog box was required. This was a dialog prompt which masked out any hidden directories and files while presenting the user with options to save to floppy, zip, or network storage space. Using the KDE desktop interface libraries, TS&D created a new dialog interface for xPDF using the KDialog function library. This presented the user with a clean and uncomplicated interface to saving a PDF file that included the default filename.

Floppy Disk Removal

In order to keep the use of removable media as simple as possible, users should be able to insert and remove both floppy and zip disks at will. This is standard in a Windows environment. Under Linux, normally a disk must be "mounted" to be used and "un-mounted" before the media is physically removed. Many options were examined ranging from buttons on the desktop to press to perform the mounting/un-mounting actions to educating the user on how to properly mount/un-mount drives. None were preferable. TS&D ended up using a kernel patch called "AutoMounter" to solve this problem. AutoMounter constantly mounts and un-mounts the drives in real-time. This way a user can place a floppy disk in the floppy drive and it will automatically mount and become available. When the user saves to the drive, the cache is immediately flushed to the drive. This way the user can remove the disk with assurance that the data has completely saved to the disk before it is removed. The same behavior takes place with the zip drive. AutoMounter does not behave well with WINE. Therefore, a user must insert the removable media before launching a WINE run application in order for the drive to be available within the Windows application.

Post-Implementation Assessment

Upon completion of the E3 project, a post-implementation assessment will be performed covering the project planning and execution, as well as the end-user response.

Project Assessment

The following areas will be covered in the post-implementation assessment of the project:

- Project Management/Manager
- Quality
- Scope Creep
- Expenditures
- Stakeholder Involvement
- Communication
- Skills
- Timeline
- Success

End-User Assessment

The following areas will be covered in the post-implementation assessment of the end product:

- Ease of Use
- Layout Design
- Application Use
- Printing
- Saving Files
- Experience of “old” vs. “new”

Resources

Resources

Resources are broken down into two general categories- hardware and software. Hardware resources needed for the E3 project to be successful have been identified by utility. The public workstations, classroom workstations, and Library circulation transaction stations contain similar or like components to maximize flexibility in future utilization and applications. Servers contain unique components characteristic to each unique server function or service. Software resources are obtained from commercial and open-source suppliers. All software used in E3 meets TS&D's requirement for long-term sustainability.

Hardware Specifications

Computing hardware for E3 is broken into four categories- transaction services, public access, classroom instruction, and server. Each of these categories have specific hardware requirements mandated by the software and system architecture outlined for E3. The following pages include specification sheets for each system used in E3.

Circulation

Item		Description	Integrated
Case:	Hon Hai 7C443-115 ATX	Black Color	
Power Supply:	300W	AMD Apprvd.	
Motherboard:	ECS K7SEM-266		
CPU:	AMD Athlon XP	1900PR, 1.6GHz	
CPU Fan:	Coolermaster Univ.	XP 1600+,case fan slot blowr	
Memory:	2x512mb PC133	Gen. Lifetime	
Video:	SiS 730S	4x AGP	☒
Zip Drive:	Zip 250	Internal ATAPI	
Floppy Drive:	1.44	Teac	
CDROM Drive:	Mitsumi 48X	Black Bezel	
Hard Drive :	20gb ATA100 7200rpm	Western Digital	
HD Controller:	UDMA 33/66/100	2 ports	☒
Network Card:	10/100	Intel Pro/100 S	☐
Mouse:	Logitech Optical	PS/2	
Keyboard:	Generic Classic	(black)	
Security Cable:			
Monitor:	PLANAR CT1744Z	17.4IN LCD Black	

Information

Equipment specified to allow Microsoft client OS and Linux OS. All equipment BLACK in color.
17.4 inch LCD flat screens to allow for Innovative Interfaces Inc. JAVA circulation client geometry.

Project: **E3**	Project ID: 35	Date: **3-14-2002**	
Location: Circulation Counter		User: AS Staff	
Supplier: BCD2000 +	Quantity: 3	Price Each: 1522.59	
Product Name: ***Custom***	Type: **Desktop**	Support: **TS&D**	
Description:		Lifespan: **36m**	
Parts purchased from BCD2000.com, Microwarehouse.com, Computergate.com, Techsaver.com, CPUsolutions.com and CDWG.com			
Assemble, test, and burn-in by TS&D. Integrations with existing			
Scanning equipment required			

Classroom

Item		Description	Integrated
Case:	Med Tower	Hon Hai 7C443-115ATX Case-Blk	
Power Supply:	ATX 300w	AMD App.	
Motherboard:	ECS K7SEM-266	Socket A	
CPU:	AMD Duron 1ghz	Socket A	
CPU Fan:	Coolmaster Univ.	XP1600+	
Memory:	2x512MB PC133	Gen. Lifetime	
Video:	SiS 730S	4x AGP	☒
Zip Drive:	Zip 250	Internal ATAPI	
Floppy Drive:	1.44	Teac	
CDROM Drive:			
Hard Drive :	20gb ATA100	Western Digital 7200rpm	
HD Controller:	UDMA 33/66/100	2 ports	☒
Network Card:	10/100	Intel Pro/100 S	☐
Mouse:	Logitech Optical	PS/2	
Keyboard:	Generic Classic	(black)	
Security Cable:	Hex Nut	Case lock	

Information

Client workstations capable of PXE booting from network and allowing local RAMDisk creation for downloading bootable Linux kernel, mounting local file system, and saving to local drives
Client workstation capable of using Windows operating system

INVENTORY COLOR=GREEN

Project:	**E3**	Project ID:	44	Date:	**3-21-2002**
Location:	**Classroom**			User:	**Student**
Supplier:	BCD2000 +	Quantity:	68	Price Each:	$521.65
Product Name:	***Custom***	Type:	**Desktop**	Support:	**TS&D**
Description:				Lifespan:	**36m**
Parts purchased from BCD2000.com, Microwarehouse.com, Computergate.com, Techsaver.com and CDWG.com					
Assemble, test, and burn-in by TS&D.					

PAC

Item		Description	Integrated
Case:	Med Tower	Hon Hai 7C443-115ATX Case-Blk	
Power Supply:	ATX 300w	AMD App.	
Motherboard:	ECS K7SEM-266	Socket A	
CPU:	AMD Duron 1ghz	Socket A	
CPU Fan:	Coolmaster Univ.	XP1600+	
Memory:	2x512MB PC133	Gen. Lifetime	
Video:	SiS 730S	4x AGP	☒
Zip Drive:	Zip 250	Internal ATAPI	
Floppy Drive:	1.44	Teac	
CDROM Drive:			
Hard Drive :			
HD Controller:	UDMA 33/66/100	2 ports	☒
Network Card:	10/100	Intel Pro/100 S	☐
Mouse:	Logitech Optical	PS/2	
Keyboard:	Generic Classic	(black)	
Security Cable:	Hex Nut	Case lock	

Information

Client workstations capable of PXE booting from network and allowing local RAMDisk creation for downloading bootable Linux kernel, mounting local file system, and saving to local drives

INVENTORY COLOR=NEON SALMON

Project:	**E3**	Project ID:	85	Date:	**3-14-2002**
Location:	Atrium and 1st, 2nd, 3rd floors			User:	Public
Supplier:	BCD2000 +	Quantity:	68	Price Each:	$521.65
Product Name:	***Custom***	Type: **Desktop**		Support:	**TS&D**
Description:				Lifespan:	**36m**
Parts purchased from BCD2000.com, Microwarehouse.com, Computergate.com, Techsaver.com and CDWG.com					
Assemble, test, and burn-in by TS&D. 8 new PACs for new locations					
8 of the quantity are for spares without cases.					

Server Display Monitor

Item	Description	Integrated
Case:		
Power Supply:		
Motherboard:		
CPU:		
CPU Fan:		
Memory:		
Video:		☐
Zip Drive:		
Floppy Drive:		
CDROM Drive:		
Hard Drive :		
HD Controller:		☐
Network Card:		☐
Mouse:		
Keyboard:		
Security Cable:		

Information

Planar 15-inch Multi-Media LCD 1024X768 Analog

Project:	**E3**	Project ID:		Date: 3-22-2002	
Location:	**Server Room 117**	User:		**TS&D**	
Supplier:	Microwarehouse	Quantity:	14	Price Each:	$369.95
Product Name:***FWT1503Z***	Type:**LCD Display**			Support:	**TS&D**
Description:				Lifespan:	**36m**
3-Year "Customer First" warranty with FREE 2-Day Air product replacement					
For use in server room					

Server-WLIBBACK

Item		Description	Integrated
Case:	CS-WS-FS7 10 Bays	Blue on Black	
Power Supply:	350watt PS		
Motherboard:	Tyan Tiger MPX	S2466N-4M	
CPU:	AMD Athlon XP1700	1.47GHz	
CPU Fan:	Copper Cooling Fan		
Memory:	(1GB) ECC REGISTERED DDR 266MHZ PC2100	184PIN (128X72)	
Video:	S3	Generic	☐
Zip Drive:			
Floppy Drive:	1.44	Teac FD235HFA29	
CDROM Drive:	DVD drive 16X	Samsung	
Hard Drive :	**2x** 40GB EIDE Ultra-ATA/100 7200RPM	IBM Deskstar 120GXP Hot Swap	
HD Controller:	Promise FastTrak100 TX2 Adaptec SCSI Card 29160	IDE RAID Ultra 160 SCSI for tape drive	☐
Network Card:	Intel PRO/1000 T	Network Adapter	☐
Mouse:	Optical Mouse	Logitech	
Keyboard:	Classic Keyboard	Generic(black)	
Security Cable:			

Information

Project:	**E3**		Project ID: 71	Date: 08/05/02	
Location:	**Server Room 117**		User:	**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	
Product Name:	***Custom***	Type: **Server**		Support:	**TS&D**
Description:	Tape Backup			Lifespan:	**36m**
Out of warranty old Dell server					

Server-WLIBBDC

Item		Description	Integrated
Case:	Dell	PowerEdge 1300	
Power Supply:	330w		
Motherboard:	Dell		
CPU:	Pentium II 400mhz		
CPU Fan:			
Memory:	256mb		
Video:	ATI 3D Rage IIc		☒
Zip Drive:			
Floppy Drive:	1.44		
CDROM Drive:	Sony IDE		
Hard Drive :	2x IBM SCSI		
HD Controller:	AIC 7890	Ultra SCSI 2	☐
Network Card:	3com 3C996	10/100/1000	☐
Mouse:	Dell		
Keyboard:	Dell		
Security Cable:			

Information

Redhat Linux-based with Samba services as a Backup Domain
Controller for WESTLIB using mirroring

Project:	**E3**		Project ID: 29	Date: 5/20/02	
Location:	**Server Room 117**		User:	**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	
Product Name:	***Custom***	Type: **Server**		Support:	**TS&D**
Description:	Backup DC			Lifespan:	**36m**
Use out of warranty old server					

Server-WLIBBOOT 1

Item		Description	Integrated
Case:	CK 1100 16-bay ATX	With fan **BLACK**	
Power Supply:	**2x**400watt hot swap	ERM-2400-v	
Motherboard:	ASUS A7M266D Dual	AMD760MPX 4DDR	
CPU:	**2x** AMD Athlon MP	1800+ 266Mhz	
CPU Fan:			
Memory:	**4x** 1024MB(1GB) ECC REGISTERED DDR	266MHZ PC2100 184PIN (128X72)	
Video:	S3	generic	☐
Zip Drive:			
Floppy Drive:	1.44MB	Teac FD235HFA29	
CDROM Drive:	DVD drive 16X	Samsung IDE	
Hard Drive :	**4x** 120GXP 80GB EIDE Ultra-ATA/100	IBM Deskstar 7200RPM hot swap	
HD Controller:	3Ware Escalade	IDE RAID 5	☐
Network Card:	Intel PRO/1000 T	Gb Server Adapt	☐
Mouse:	Optical Mouse	Logitech	
Keyboard:	Generic Classic	BLACK	
Security Cable:			

Information

Clustered with matching WLIBBOOT2
All components Red Hat certified

INVENTORY COLOR=YELLOW

Project:	**E3**	Project ID:	80	Date:	**3-21-02**
Location:	**Server Room 117**	User:		**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	$4747.77
Product Name:	***Custom***	Type:	**Server**	Support:	**TS&D**
Description:	**PXE Boot and image server**	Lifespan:	**36m**		

Server-WLIBBOOT2

Item		Description	Integrated
Case:	CK 1100 16-bay ATX	With fan **BLACK**	
Power Supply:	**2x**400watt hot swap	ERM-2400-v	
Motherboard:	ASUS A7M266D Dual	AMD760MPX 4DDR	
CPU:	**2x** AMD Athlon MP	1800+ 266Mhz	
CPU Fan:			
Memory:	**4x** 1024MB(1GB) ECC REGISTERED DDR	266MHZ PC2100 184PIN (128X72)	
Video:	S3	generic	☐
Zip Drive:			
Floppy Drive:	1.44MB	Teac FD235HFA29	
CDROM Drive:	DVD drive 16X	Samsung IDE	
Hard Drive :	**4x** 120GXP 80GB EIDE Ultra-ATA/100	IBM Deskstar 7200RPM hot swap	
HD Controller:	3Ware Escalade	IDE RAID 5	☐
Network Card:	Intel PRO/1000 T	Gb Server Adapt	☐
Mouse:	Optical Mouse	Logitech	
Keyboard:	Generic Classic	BLACK	
Security Cable:			

Information

Clustered with matching WLIBBOOT1
All components Red Hat certified

INVENTORY COLOR=YELLOW

Project:	**E3**		Project ID: 80	Date: **3-21-02**	
Location:	**Server Room 117**		User:	**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	$4747.77
Product Name:	***Custom***	Type: **Server**		Support:	**TS&D**
Description: **PXE Boot image server**				Lifespan:	**36m**
Assemble, test, burn-in, and support by TS&D.					

WLIBCLONE

Item		Description	Integrated
Case:	Dell	PowerEdge 1300	
Power Supply:	330w		
Motherboard:	Dell		
CPU:	Pentium II 400mhz		
CPU Fan:			
Memory:	256mb		
Video:	ATI 3D Rage IIc		☒
Zip Drive:			
Floppy Drive:	1.44		
CDROM Drive:	Sony IDE		
Hard Drive :	2x IBM 4.3gb		
HD Controller:	AIC 7890	Ultra SCSI 2	☐
Network Card:	3com 3c996	10/100/1000	☐
Mouse:	Dell		
Keyboard:	Dell		
Security Cable:			

Information

Use old WLIBINTRA Dell PowerEdge 1300

Project:	**E3**		Project ID: 31	Date: 5/6/02	
Location:	**Server Room 117**		User:	**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	
Product Name:	***Custom***	Type:	**Server**	Support:	**TS&D**
Description:				Lifespan:	**36m**
Use out of warranty old server					

WLIBDB

Item		Description	Integrated
Case:	CS-WS-FS7 10 Bays	Blue on Black	
Power Supply:	350watt PS		
Motherboard:	ASUS A7M266D Dual	AMD760MPX 4DDR	
CPU:	AMD Athlon XP1700	1.47GHz	
CPU Fan:			
Memory:	(3GB) ECC REGISTERED DDR 266MHZ PC2100	184PIN (128X72)	
Video:	S3	Generic	☐
Zip Drive:			
Floppy Drive:	1.44	Teac FD235HFA29	
CDROM Drive:	DVD drive 16X	Samsung	
Hard Drive :	**2x** 40GB EIDE Ultra-ATA/100 7200RPM	IBM Deskstar 120GXP Hot Swap	
HD Controller:	Promise FastTrak100 TX2	IDE RAID	☐
Network Card:	Intel PRO/1000 T	Network Adapter	☐
Mouse:	Optical Mouse	Logitech	
Keyboard:	Classic Keyboard	Generic(black)	
Security Cable:			

Information

INVENTORY COLOR=RED

Project:	**E3**		Project ID: 60	Date: **3-21-2002**	
Location:	**Server Room 117**		User:	**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	$2487.34
Product Name:	***Custom***	Type: **Server**		Support:	**TS&D**
Description:				Lifespan:	**36m**
Assemble, test, supported, and burn-in by TS&D.					

WLIBFILE

Item		Description	Integrated
Case:	Antec		
Power Supply:	330w		
Motherboard:	Abit	KD7KT4	
CPU:	AMD Athlon	1700XP	
CPU Fan:	CoolerMaster		
Memory:	512MB DDR	PC2700	
Video:	S3	Diamond Stealth	☐
Zip Drive:	Zip 100	IDE	
Floppy Drive:	1.44		
CDROM Drive:	Samsung DVD		
Hard Drive :	40GB 7200rpm	Maxtor ATA	
HD Controller:	IDE AHA-2940U/U2W		☒ ATA
Network Card:	3com 3c996	10/100/1000	☐
Mouse:	Dell		
Keyboard:	Dell		
Security Cable:			

Information

Connect 8 drive SCSI DVD Tower

Project:	**E3**		Project ID: 76	Date: 9/9/02	
Location:	**Server Room 117**		User:	**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	spare parts
Product Name:	***Custom***		Type: **Server**	Support:	**TS&D**
Description:				Lifespan:	**36m**
Assemble, test, and burn-in by TS&D.					

WLIBNET

Item		Description	Integrated
Case:	Enlight 8960 10bay	white	
Power Supply:	**2x** 400watt PS	Hot swappable	
Motherboard:	ASUS A7M266D Dual	AMD760MPX 4DDR	
CPU:	AMD Athlon XP1700	1.47GHz	
CPU Fan:			
Memory:	(3GB) ECC REGISTERED DDR 266MHZ PC2100	184PIN (128X72)	
Video:	S3	Diamond Stealth Video 2001 2mb	☐
Zip Drive:			
Floppy Drive:	1.44	Teac FD235HFA29	
CDROM Drive:	DVD drive		
Hard Drive :	**4x** 60GB EIDE Ultra-ATA/100 7200RPM	Quantum Fireball hot swap	
HD Controller:	3Ware Escalade	IDE RAID 5 3+1spare	☐
HD Controller:	Adaptec SCSI Card 29160	Ultra 160 SCSI for Tape Drive	☐
Network Card:	Intel PRO/1000 T	Network Adapter	☐
Mouse:	Optical Mouse	Logitech	
Keyboard:	Classic Keyboard	Generic(black)	
Security Cable:			

Information

Library Intranet & development server with MySQL server
Use existing HP SureStore 24DAT tape backup drive
7-drive external SCSI CDROM tower attached

Project:	**E3**		Project ID: 52	Date:	**3-21-2002**
Location:	Server Room 117		User:	Web Council/TS&D	
Supplier:	+	Quantity:	1	Price Each:	$5862.44
Product Name:	***Custom***	Type:	**Server**	Support:	**TS&D**
Description:				Lifespan:	**36m**
Assemble, test, supported, and burn-in by TS&D.					

WLIBINFO

Item		Description	Integrated
Case:	Antec		
Power Supply:	300watt		
Motherboard:	Abit BX RAID		
CPU:	AMD Thunderbird	900mhz	
CPU Fan:			
Memory:	768 SDRAM	PC133	
Video:	Diamond Stealth 3D	2mb	☐
Zip Drive:	Zip 100 ATAPI		
Floppy Drive:	Sony 1.44		
CDROM Drive:	Generic 40x		
Hard Drive :	Seagate 20gb	7200rpm	
HD Controller:	UDMA/33		☒
Network Card:	3COM 996 10/100/1K		☐
Mouse:	Generic		
Keyboard:	Generic		
Security Cable:	none		

Information

WLIBINFO serves web-based project information on E3.

It also serves as a repository for the ASU West Campus

Linux & Embedded Systems User Group

Project:	**E3**		Project ID: 65	Date: 6/02	
Location:	**Server Room 117**		User:	**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	spare parts
Product Name:	***Custom***	Type: **Server**		Support:	**TS&D**
Description:				Lifespan:	**36m**
Project and user-group information server					
Assemble, test, and burn-in by TS&D.					

WLIBSEC

Item		Description	Integrated
Case:	Dell	PowerEdge 1300	
Power Supply:	330w		
Motherboard:	Dell		
CPU:	Pentium III 500mhz		
CPU Fan:			
Memory:	256mb		
Video:	ATI Rage 3D IIc		☒
Zip Drive:			
Floppy Drive:	1.44		
CDROM Drive:	Samsung IDE		
Hard Drive :	8.6gb	IBM	
HD Controller:	AIC 7890 SCSI	Ultra 2	☐
Network Card:	3com 3c996	10/100/1000	☐
Mouse:	Dell		
Keyboard:	Dell		
Security Cable:			

Information

Use Current Security Server

Project:	**E3**		Project ID: 78	Date: 9/16/02	
Location:	**Server Room 117**		User:	**TS&D**	
Supplier:	+		Quantity: 1	Price Each:	
Product Name:	***Custom***	Type: **Server**		Support:	**TS&D**
Description:				Lifespan:	**36m**
Use out of warranty old server.					

WLIBPDC

Item		Description	Integrated
Case:	CS-WS-FS7 10 Bays	Blue on Black	
Power Supply:	350watt PS		
Motherboard:	ASUS A7V266 WOA(w/o audio)	VIAKT266 ATX	
CPU:	AMD Athlon XP1700	1.47GHz	
CPU Fan:	Copper Cooling Fan		
Memory:	(1GB) ECC REGISTERED DDR 266MHZ PC2100	184PIN (128X72)	
Video:	S3	Generic	☐
Zip Drive:			
Floppy Drive:	1.44	Teac FD235HFA29	
CDROM Drive:	DVD drive 16X	Samsung	
Hard Drive :	**2x** 40GB EIDE Ultra-ATA/100 7200RPM	IBM Deskstar 120GXP Hot Swap	
HD Controller:	Promise FastTrak100 TX2	IDE RAID	☐
Network Card:	Intel PRO/1000 T	Network Adapter	☐
Mouse:	Optical Mouse	Logitech	
Keyboard:	Classic Keyboard	Generic(black)	
Security Cable:			

Information

Redhat Linux-based with Samba services as a Primary Domain

Controller for WESTLIB using mirroring
with WLIBBDC

INVENTORY COLOR=BLUEDOT

Project:	**E3**	Project ID:	29	Date:	**3-26-2002**
Location:	**Server Room 117**	User:		**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	$1725.33
Product Name:	***Custom***	Type:	**Server**	Support:	**TS&D**
Description:				Lifespan:	**36m**
Assemble, test, supported, and burn-in by TS&D.					

Server-WWW1

Item		Description	Integrated
Case:	CK 1100 16-bay ATX	With fan **BLACK**	
Power Supply:	**2x**400watt hot swap	ERM-2400-v	
Motherboard:	ASUS A7M266D Dual	AMD760MPX 4DDR	
CPU:	**2x** AMD Athlon MP	1800+ 266Mhz	
CPU Fan:			
Memory:	**4x** 1024MB(1GB) ECC REGISTERED DDR	266MHZ PC2100 184PIN (128X72)	
Video:	S3	generic	☐
Zip Drive:			
Floppy Drive:	1.44MB	Teac FD235HFA29	
CDROM Drive:	DVD drive 16X	Samsung IDE	
Hard Drive :	**4x** 120GXP 80GB EIDE Ultra-ATA/100	IBM Deskstar 7200RPM hot swap	
HD Controller:	3Ware Escalade	IDE RAID 5	☐
Network Card:	Intel PRO/1000 T	Gb Server Adapt	☐
Mouse:	Optical Mouse	Logitech	
Keyboard:	Generic Classic	BLACK	
Security Cable:			

Information

Clustered with matching WWW2
All components Red Hat certified
Main Library Web site attached to load balancer

INVENTORY COLOR=NEON ORANGE

Project:	**E3**	Project ID:	95	Date:	**3-21-02**
Location:	**Server Room 117**	User:		**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	$4747.77
Product Name:	***Custom***	Type:	**Server**	Support:	**TS&D**
Description:	**Main Library Web site**			Lifespan:	**36m**
Assemble, test, burn-in, and support by TS&D.					

Server-WWW2

Item		Description	Integrated
Case:	CK 1100 16-bay ATX	With fan **BLACK**	
Power Supply:	**2x**400watt hot swap	ERM-2400-v	
Motherboard:	ASUS A7M266D Dual	AMD760MPX 4DDR	
CPU:	**2x** AMD Athlon MP	1800+ 266Mhz	
CPU Fan:			
Memory:	**4x** 1024MB(1GB) ECC REGISTERED DDR	266MHZ PC2100 184PIN (128X72)	
Video:	S3	generic	☐
Zip Drive:			
Floppy Drive:	1.44MB	Teac FD235HFA29	
CDROM Drive:	DVD drive 16X	Samsung IDE	
Hard Drive :	**4x** 120GXP 80GB EIDE Ultra-ATA/100	IBM Deskstar 7200RPM hot swap	
HD Controller:	3Ware Escalade	IDE RAID 5	☐
Network Card:	Intel PRO/1000 T	Gb Server Adapt	☐
Mouse:	Optical Mouse	Logitech	
Keyboard:	Generic Classic	BLACK	
Security Cable:			

Information

Clustered with matching WWW1
All components Red Hat certified
Main Library Web site attached to load balancer

INVENTORY COLOR=NEON ORANGE

Project:	**E3**	Project ID:	95	Date:	**3-21-02**
Location:	**Server Room 117**	User:		**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	$4747.77
Product Name:	***Custom***	Type:	**Server**	Support:	**TS&D**
Description:	**Main Library Web site**			Lifespan:	**36m**
Assemble, test, burn-in, and support by TS&D					

WLIBTRIS

Item		Description	Integrated
Case:	CS-WS-FS7 10 Bays	Blue on Black	
Power Supply:	350watt PS		
Motherboard:	ASUS A7V266 WOA(w/o audio)	VIAKT266 ATX	
CPU:	AMD Athlon XP1700	1.47GHz	
CPU Fan:	Copper Cooling Fan		
Memory:	(3GB) ECC REGISTERED DDR 266MHZ PC2100	184PIN (128X72)	
Video:	S3	Generic	☐
Zip Drive:			
Floppy Drive:	1.44	Teac FD235HFA29	
CDROM Drive:	DVD drive 16X	Samsung	
Hard Drive :	**2x** 80GB EIDE Ultra-ATA/100 7200RPM	IBM Deskstar 120GXP hot swap	
HD Controller:	Promise FastTrak100 TX2	IDE RAID	☐
Network Card:	Intel PRO/1000 T	Network Adapter	☐
Mouse:	Optical Mouse	Logitech	
Keyboard:	Classic Keyboard	Generic(black)	
Security Cable:			

Information

INVENTORY COLOR=YELLOW ORANGE DOT

Project:	**E3**	Project ID:	82	Date:	**3-26-2002**
Location:	**Server Room 117**	User:		**TS&D**	
Supplier:	+	Quantity:	1	Price Each:	$2655.31
Product Name:	***Custom***	Type:	**Server**	Support:	**TS&D**
Description:				Lifespan:	**36m**
Assemble, test, supported, and burn-in by TS&D					

Server-WLIBBACK –tape storage

Item	Description	Integrated
Overland LoaderXpress	SCSI External Tape Autoloader	

Information

# Cartridges	10
Capacity (compressed)	(800 GB)
Capacity (native)	400 GB
Data Transfer Rates	
Compressed (1 drive)	(43.2 GB/hour)
Native (1 drive)	21.6 GB/hour
# Slots per magazine	10
Interface	LVD

Project:	**E3**	Project ID:	71	Date:	08/05/02
Location:	**Server Room 117**	User:		**TS&D**	
Supplier:	CDWG +	Quantity:	1	Price Each:	$3500
Product Name:	**LoaderXpress**	Type:	**Tape Drive**	Support:	**TS&D**
Description:	Tape Backup			Lifespan:	**36m+**

Server-WLIBLDAP

Item		Description	Integrated
Case:	CK 1100 16-bay ATX	With fan **BLACK**	
Power Supply:	**2x**400watt hot swap	ERM-2400-v	
Motherboard:	Tyan Tiger	S2426MPX 4DDR	
CPU:	**2x** AMD Athlon MP	2000+ 266Mhz	
CPU Fan:			
Memory:	**3x** 1024MB(1GB) ECC REGISTERED DDR	266MHZ PC2100 184PIN (128X72)	
Video:	S3	generic	☐
Zip Drive:	Zip 250	ATAPI	
Floppy Drive:	1.44MB	Teac FD235HFA29	
CDROM Drive:	DVD drive 16X	Samsung IDE	
Hard Drive :	**4x** 120GXP 80GB EIDE Ultra-ATA/100	IBM Deskstar 7200RPM hot swap	
HD Controller:	3Ware Escalade	IDE RAID 5	☐
Network Card:	Intel PRO/1000 T	Gb Server Adapt	☐
Mouse:	Optical Mouse	Logitech	
Keyboard:	Generic Classic	BLACK	
Security Cable:			

Information

LDAP Server for authentication
All components Red Hat certified

Project:	**E3**		Project ID: 80	Date: **3-21-02**	
Location:	**Server Room 117**		User:	**TS&D**	
Product Name:	***Custom***	Type: **Server**		Support:	**TS&D**
Supplier:	+	Quantity:	1	Price Each:	$4747.77
Description: **Print Server**				Lifespan:	**36m**
Assemble, test, burn-in, and support by TS&D					

Server-WLIBPRINT

Item		Description	Integrated
Case:	Dell	PowerEdge 1300	
Power Supply:	330w		
Motherboard:	Dell		
CPU:	2xPentium II 400mhz	MP	
CPU Fan:			
Memory:	512MB		
Video:	ATI 3D Rage IIc		☒
Zip Drive:	Zip 250		
Floppy Drive:	1.44		
CDROM Drive:	Sony IDE		
Hard Drive :	40GB EIDE		
HD Controller:	AIC 7890/IDE Onboard	Ultra SCSI 2	☐
Network Card:	3com 3C996	10/100/1000	☐
Mouse:	Dell		
Keyboard:	Dell		
Security Cable:			

Information

Temporary Print Server until December 2003

Redhat

Project:	**E3**		Project ID: 29	Date: 5/20/02	
Location:	**Server Room 117**		User:	**TS&D**	
Supplier:	+	Quantity: 1	Price Each:		
Product Name:	***Custom***	Type: **Server**		Support:	**TS&D**
Description:	Backup DC			Lifespan:	**36m**
Use out of warranty old server					

Software Specifications

Operating System
All Linux servers use various versions of Redhat Linux. Unless there are relevant vulnerabilities with a particular Linux kernel version, updates to the kernel will be minimal. The stability and reliability of the Linux kernel ensure the maximum uptime allowable. All legacy Windows servers use Microsoft Windows NT version 4. These are short-lived servers and will be phased out within 12 months of project completion.

Security
All servers use a method of IPTables to specifically identify ports, protocols, and hardware device characteristics for incoming and outgoing network communication. The rules set for each network device is to be configured specifically for the unique services offered by the device. IPTables is used in this manner as a firewall for each machine. In addition, the security server will perform additional security applications on each server and client through monitoring and updating in passive and active modes. Local passwords will be kept to a minimum and rely mainly on Kerberos authenticated and authorized user accounts.

Desktop Interface
The default interface for servers will be the terminal console. The majority of activity performed by the server administrator can be done through the terminal console. This keeps the CPU overhead required by a desktop interface at a minimum. Where a graphical interface is required, the KDE Desktop Environment using the Xfree86 X-Windows Graphical Server Engine will be used and called from the terminal console on demand.

Packages
The preferred method for application distribution and installation is the RPM (Redhat Package Manager). In addition, packages assembled by Redhat take precedence over all other RPM sources. When an RPM is not available, tarball or gzipped archives are acceptable and are usually necessary when compiling from source. Careful attention must be made in the locations that source Make files build to. Redhat uses some unconventional file location placements with certain packages. Consistency and system integrity must be adhered to.

Compiler and Languages
The GNU GCC compiler and linker are recommended for compiling on all E3 systems. In addition, bash, awk, PHP, Perl, and Java are required for most systems.

Purchasing

Before purchasing of equipment takes place, the careful processes of identifying needs, measurements, and solutions occurs first. TS&D has invested considerable time analyzing each component of these processes to ensure all investments meet expectations.

Needs to Satisfy

TS&D has identified various qualifiers that need to be satisfied with the new workstations and architecture. The following list was used as measurements for qualifying a candidate solution.

- Stable operating system, software, and hardware
- Highly customizable operating system, software and hardware
- Large available software-base
- Currently available support literature
- Interoperability with other systems
- Remote boot/image
- System monitoring
- Web browser interface customizable
- Removable media storage
- Print capability
- Security
- Fast-reliable network
- Small client hardware physical form factor

Standard Measures used in Equipment Purchase Selection

There are many factors considered when equipment purchases are made. Standard Measures for equipment purchases include: Productivity, Connectivity, Expandability, Reliability, Performance, Accessibility, Cost and Lifespan.

Productivity

The ability to use computing hardware and software to produce. This includes methods and means to design and produce.

Connectivity

The ability to connect to many like and different systems, services, hardware, and applications through communications hardware and/or software. Must exist in an "open-systems" environment.

Expandability

Must have the capability to expand through minor changes and upgrades to meet new demands and qualifiers during the unit lifespan.

Reliability

The unit must have a clean service record on parts and components. This includes tests in multiple environments. Parts should comply with industry standards and fall under the same measures as complete units. Maintenance cost utilizes 'sum-of-the-years' depreciation of equity model. [Parts replacement model can be viewed in Section 11 – *Quality Assurance*]

Performance

Unit must be competitive to superior in performance. This is measured through benchmarks on hardware and software used on the unit. Levels of performance will vary depending on individual case-by-case needs.

Accessibility

Placement, storage, size, and ease-of-use, by the unit must try to meet recommendations made by user and employer.

Cost

Cost of unit should be weighed with all other measures to find an optimal priced product.

Lifespan

A unit is purchased with a total life of 36 months. After 36 months, the unit has expired and shall be reviewed by TS&D for disposal, salvage, relocation, etc. 36 months is an arbitrary measure- the lifespan may actually be greater or less than this value.

Solutions Identified

TS&D identified the following solutions that met the Needs to Qualify criteria:

- Linux OS client/server
- X86 custom hardware
- Mozilla browser
- Zip media
- Network printing
- SysORB, Nessus, Tripwire, and NetSaint monitoring
- Secured VLAN
- New segmented network hw and wiring providing 1gbit server-server and 100mbit to client
- New subnet
- Diskless client hardware
- SAMBA support
- FooMatic print support
- DHCP
- PXE wired for management remote boot and image on demand
- 1GB RAM for client HW
- Clustered servers for fault tolerance and load-sharing

RAID 0+1 and RAID 5 on servers

Standard Measures used in Vendor Selection

The selection of vendors involves input from multiple sources to ensure the Library is maximizing it's purchasing power while not compromising the end-product. The following criteria was used in vendor selection. The University uses a select list of preferred vendors to use for various computer product purchases. If these vendors can not meet the request, an alternate vendor needs to be identified. A list containing a minimum of three separate vendors with quotes is created. The return quotes are inspected for error and a candidate vendor is selected. The Library investigates previous

relationships, transactions, consumer reports, and independent reviews to further substantiate the use of the vendor. Price, delivery times, return policy, warranties honored, and vendor supply chain are also factors for inclusion. Once a vendor is selected, standard University procurement procedures are followed.

Warranty Coverage

TS&D has identified the best practice for the E3 project is to perform a "build vs. buy" analysis. The result of the analysis identified the "build" model best supports the desired E3 outcomes of cost containment, flexibility of component selection, quality, component reliability, software compatibility, and utility. TS&D will utilize OEM honored parts warranties as well as maintain a small inventory of components that are susceptible to wear over time. TS&D can best address component troubleshooting by being on-site and timely. The intimate knowledge in the components of each system provides a foundation for which diagnosis and solutions can be obtained. Any parts needed that are not located on-site can be purchased from local vendors using a "just in time" model of service. TS&D also purchased a SIMM memory tester to aid in diagnosis of presumably problematic computer memory.

Test Units

TS&D purchased from candidate vendors components to be assembled and tested. After identifying the systems that met the TS&D Equipment Qualifiers, and software compatibility testing was complete, rigorous burn-in testing was performed. The testing process identified what components would be used in production machines.

Purchasing Worksheet

Location	Item	Description	Qty
Classroom1	**Case**	Hon Hai 7C443-115 ATX Case, With P4 Power Supply, Black Color	30
Classroom1	**CPU**	AMD Duron 1ghz OEM	30
Classroom1	**CPU Fan**	Coolermaster Universal Fan	30
Classroom1	**Floppy Drive**	Teac FD235HFA29 1.44MB	30
Classroom1	**Hard Drive**	Western Digital 20gb ATA100 7200rpm	30
Classroom1	**Keyboard**	Belkin Classic Keyboard (black)	30
Classroom1	**LAN**	Intel Pro/100 S Desktop Adapter w/3DES 168-Bit Encryption	30
Classroom1	**Monitor**	Planar FWT1503Z	30
Classroom1	**Motherbd**	ECS K7SEM-266	30
Classroom1	**Mouse**	Logitech Optical Mouse	30
Classroom1	**RAM**	512mb PC133	30
Classroom1	**Security Lock**	Hex Nut	30
Classroom1	**ZIP**	Zip 250	30
Misc	**MISC**	DeployCenter 5.0	1
Misc	**MISC**	Romtec Trios IDE Hard Drive Selector	1
Misc	**MISC**	SP3000 Combo Tester	1
MiscServer	**Backup Software**	NovaNET 8.5 Unlimitted for Linux	1
MiscServer	**DB Software**	NuSphere MySQL Advantage	1
MiscServer	**Linux**	RedHat Linux Professional	1
MiscServer	**Monitor**	Planar FWT1503Z	14
MiscServer	**Storage Tower**	(8) 16x DVD-ROM Tower For Server Attached Storage (SCSI)	1
MiscServer	**Video Card**	Generic SIS 6326 Hardware 3D 4MB, 64Bit Graphic Engine, 2X AGP	6
MiscServer	**Software**	Win4Lin	2
PAC	**Case**	Hon Hai 7C443-115 ATX Case, With P4 Power Supply, Black Color	60
PAC	**CPU**	AMD Duron 1ghz OEM	68
PAC	**CPU Fan**	Coolermaster Universal Fan	68
PAC	**Floppy Drive**	Teac FD235HFA29 1.44MB	68
PAC	**Keyboard**	Belkin Classic Keyboard (black)	68
PAC	**LAN**	Intel Pro/100 S Desktop Adapter w/3DES 168-Bit Encryption	68
PAC	**Motherbd**	ECS K7SEM-266	68
PAC	**Mouse**	Logitech Optical Mouse	68
PAC	**RAM**	512mb PC133	68
PAC	**Security Lock**	Hex Nut	68
PAC	**ZIP**	Zip 250	68

Location	Item	Description	Qty
WLIBBOOT	**Case**	CK-1100 16 bay Server BLACK	2
WLIBBOOT	**Case Fan**	12CM ballbearing case fan	3
WLIBBOOT	**Contlr Card**	Promise SuperTrak SX6000	2
WLIBBOOT	**CPU**	AMD Athlon MP 1800+ (1.533GHZ)266Mhz	4
WLIBBOOT	**CPU Fan**	Copper Cooling Fan	8
WLIBBOOT	**Drive Trays**	Promise SuperSwap	8
WLIBBOOT	**DVD ROM**	Samsung DVD drive 16X (RETAIL), Beige	2
WLIBBOOT	**Floppy Drive**	Teac 1.44MB FD235-**BLACK**	2
WLIBBOOT	**Hard Drive**	IBM Deskstar 120GXP 80GB EIDE Ultra-ATA/100 5 7200RPM	10
WLIBBOOT	**Keyboard**	Belkin Classic Keyboard (black)	2
WLIBBOOT	**LAN**	Intel PRO/1000 T Server Adapter	2
WLIBBOOT	**Motherboard**	ASUS A7M266D Dual,AMD760MPX 4DDR Aud	2
WLIBBOOT	**Mouse**	Logitech Optical Mouse	2
WLIBBOOT	**Power Supply**	2x400Watt ATX swappable	3
WLIBBOOT	**RAM**	1024MB(1GB) ECC REGISTERED DDR 266MHZ PC2100 184PIN (128X72)	8
WLIBDB	**Case**	CS-WS-FS7 10 Bays Blue on Black w/350watt PS	1
WLIBDB	**Case Fan**	FAN-8-B-4	2
WLIBDB	**Contlr Card**	Promise FastTrak100 TX2	1
WLIBDB	**CPU**	AMD Boxed Athlon XP 1700	1
WLIBDB	**CPU Fan**	Copper Cooling Fan	1
WLIBDB	**Drive Trays**	Promise SuperSwap	2
WLIBDB	**DVD ROM**	Samsung DVD drive 16X (RETAIL), Beige	1
WLIBDB	**Floppy Drive**	Teac FD235HFA29 1.44MB	1
WLIBDB	**Hard Drive**	IBM Deskstar 120GXP 40GB EIDE Ultra-ATA/100 5 7200RPM	3
WLIBDB	**Keyboard**	Belkin Classic Keyboard (black)	1
WLIBDB	**LAN**	Intel PRO/1000 T Server Adapter	1
WLIBDB	**Motherboard**	ASUS A7V266 WOA(w/o audio) VIAKT266 ATX	1
WLIBDB	**Mouse**	Logitech Optical Mouse	1
WLIBDB	**Power Supply**	included in case	0
WLIBDB	**RAM**	1024MB(1GB) ECC REGISTERED DDR 266MHZ PC2100 184PIN (128X72)	3

Location	Item	Description	Qty
WLIBINTRA	**Controller Card**	Adaptec SCSI Card 29160 Ultra 160 SCSI Kit PC	1
WLIBINTRA	**CPU**	AMD Boxed Athlon XP 1700	1
WLIBINTRA	**CPU Fan**	Copper Cooling Fan	1
WLIBINTRA	**Keyboard**	Belkin Classic Keyboard (black)	1
WLIBINTRA	**LAN**	Intel PRO/1000 T Server Adapter	1
WLIBINTRA	**Motherboard**	ASUS A7V266 WOA(w/o audio) VIAKT266 ATX	1
WLIBINTRA	**Mouse**	Logitech Optical Mouse	1
WLIBINTRA	**RAM**	1024MB(1GB) ECC REGISTERED DDR 266MHZ PC2100 184PIN (128X72)	3
WLIBPDC	**Case**	CS-WS-FS7 10 Bays Blue on Black w/350watt PS	1
WLIBPDC	**Case Fan**	FAN-8-B-4	2
WLIBPDC	**Contlr Card**	Promise FastTrak100 TX2	1
WLIBPDC	**CPU**	AMD Boxed Athlon XP 1700	1
WLIBPDC	**CPU Fan**	Copper Cooling Fan	1
WLIBPDC	**Drive Trays**	Promise SuperSwap	2
WLIBPDC	**DVD ROM**	Samsung DVD drive 16X (RETAIL), Beige	1
WLIBPDC	**Floppy Drive**	Teac FD235HFA29 1.44MB	1
WLIBPDC	**Hard Drive**	IBM Deskstar 120GXP 40GB EIDE Ultra-ATA/100 5 7200RPM	3
WLIBPDC	**Keyboard**	Belkin Classic Keyboard (black)	1
WLIBPDC	**LAN**	Intel PRO/1000 T Server Adapter	1
WLIBPDC	**Motherboard**	ASUS A7V266 WOA(w/o audio) VIAKT266 ATX	1
WLIBPDC	**Mouse**	Logitech Optical Mouse	1
WLIBPDC	**Power Supply**	included in case	0
WLIBPDC	**RAM**	1024MB(1GB) ECC REGISTERED DDR 266MHZ PC2100 184PIN (128X72)	1

Location	Item	Description	Qty
WLIBSTORE	**Case**	CK-1100 16 bay Server WHITE	2
WLIBSTORE	**Case Fan**	12CM ballbearing case fan	3
WLIBSTORE	**Contlr Card**	Promise SuperTrak SX6000	2
WLIBSTORE	**CPU**	AMD Athlon MP 1800+ (1.533GHZ)266Mhz	4
WLIBSTORE	**CPU Fan**	Copper Cooling Fant	8
WLIBSTORE	**Drive Trays**	Promise SuperSwap	8
WLIBSTORE	**DVD ROM**	Samsung DVD drive 16X (RETAIL), Beige	2
WLIBSTORE	**Floppy Drive**	Teac FD235HFA29 1.44MB	2
WLIBSTORE	**Hard Drive**	IBM Deskstar 120GXP 80GB EIDE Ultra-ATA/100 5 7200RPM	10
WLIBSTORE	**Keyboard**	Belkin Classic Keyboard (black)	2
WLIBSTORE	**LAN**	Intel PRO/1000 T Server Adapter	2
WLIBSTORE	**Motherboard**	ASUS A7M266D Dual,AMD760MPX 4DDR Aud	2
WLIBSTORE	**Mouse**	Logitech Optical Mouse	2
WLIBSTORE	**Power Supply**	2x400Watt ATX swappable	3
WLIBSTORE	**RAM**	1024MB(1GB) ECC REGISTERED DDR 266MHZ PC2100 184PIN (128X72)	8
WLIBTRIS	**Case**	CS-WS-FS7 10 Bays Blue on Black w/350watt PS	1
WLIBTRIS	**Case Fan**	FAN-8-B-4	2
WLIBTRIS	**Contlr Card**	Promise FastTrak100 TX2	1
WLIBTRIS	**CPU**	AMD Boxed Athlon XP 1700	1
WLIBTRIS	**CPU Fan**	Copper Cooling Fan	1
WLIBTRIS	**Drive Trays**	Promise SuperSwap	2
WLIBTRIS	**DVD ROM**	Samsung DVD drive 16X (RETAIL), Beige	1
WLIBTRIS	**Floppy Drive**	Teac FD235HFA29 1.44MB	1
WLIBTRIS	**Hard Drive**	IBM Deskstar 120GXP 80GB EIDE Ultra-ATA/100 7200RPM	3
WLIBTRIS	**Keyboard**	Belkin Classic Keyboard (black)	1
WLIBTRIS	**LAN**	Intel PRO/1000 T Server Adapter	1
WLIBTRIS	**Motherboard**	ASUS A7V266 WOA(w/o audio) VIAKT266 ATX	1
WLIBTRIS	**Mouse**	Logitech Optical Mouse	1
WLIBTRIS	**Power Supply**	included in case	0
WLIBTRIS	**RAM**	1024MB(1GB) ECC REGISTERED DDR 266MHZ PC2100 184PIN (128X72)	3

Location	Item	Description	Qty
Circulation	**Motherboard**	ECS K7SEM-266	3
Circulation	**Case**	Hon Hai 7C443-115 ATX Case, With P4 Power Supply, Black Color	3
Circulation	**CPU**	AMD Athlon XP 1900PR, 1.6GHz	3
Circulation	**CPU Fan**	Thermaltake Volcano 7 A1124 (PIII+AMD)	3
Circulation	**RAM**	512mb PC133	3
Circulation	**ZIP**	Zip 250	3
Circulation	**Hard Drive**	Western Digital 20gb ATA100 7200rpm	3
Circulation	**LAN**	Intel Pro/100 S Desktop Adapter w/3DES 168-Bit Encryption	3
Circulation	**CDROM Drive**	MITSUMI 48X CDROM Drive [IDE] [BLACK BEZEL]	3
Circulation	**Mouse**	Logitech Optical Mouse	3
Circulation	**Keyboard**	Belkin Classic Keyboard (black)	3
Circulation	**Floppy Drive**	Teac FD235HFA29 1.44MB	3
Circulation	**Display**	PLANAR CT1744Z 17.4IN LCD 1280X1024@75HZ SXGA BLK	3

Receiving

The process of receiving includes three process categories: processing, storage, and disposal. Through the act of receiving, one or more of these processes will take place. The following describes each of these processes.

Processing

Items being received must go through some processing steps. These steps include quality checks and records keeping to ensure all items received match items ordered and can be stored/retrieved in a systematic fasion.

Receiving Room

Items received through the Admin receiving room will be inspected before contact is made to the Project Manager. Upon notification of a received shipment, the Project Manager will delegate the processing.

Loading Dock

Logistics concerning items received at the Library loading dock will be coordinated by the Project Manager. Items need to be moved off the loading dock and into a storage facility upon notification of delivery.

Receiving Processing Steps

1. Review invoice to items received. Verify quantities and description
2. Mark off item received on each inventory sheet
3. Attach coresponding colored label and write item code on label
4. Store item in accordance to location identified on inventory sheet
5. Remove duplicate order sheet from file folder and give to Project Manager
6. The Project Manager will update the inventory sheet accordingly

Storage

Items need to be systematically stored and records updated to ensure accuracy of inventory and ease of accessability. The following are guidelines for proper inventory storage.

- Project Manager will identify if an item is to remain in original packaging.
- Item is to be stored in a method that will maximize utilization of space and leave colored label exposed and visible.
- Fragile or sensitive items (RAM, CPUs, etc.) will be handled and stored with care.
- Any problems or questions with storage will be communicated to the Project Manager.

Disposal

Careful attention to storage space and re-use of items shall be a primary concern of the Project Manager. The following are guidelines for proper handling of items identified for disposal.

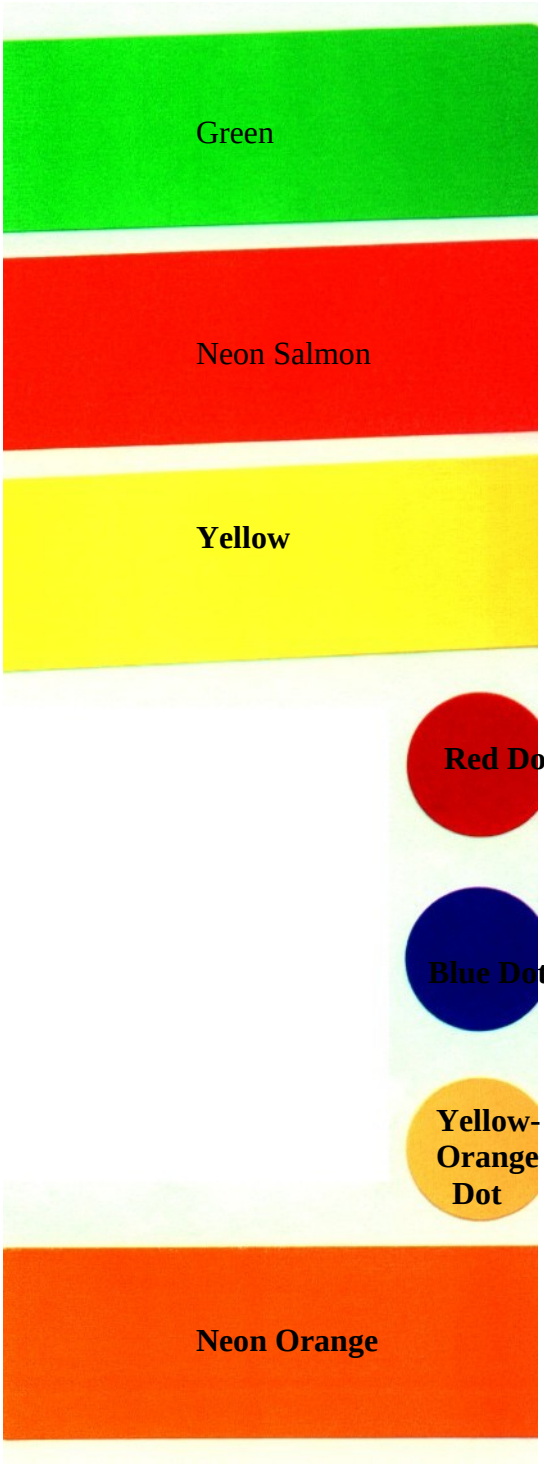
- Items identified by the Project Manager for disposal will be stored in the first floor Library Classroom closet west wall and shelving.
- When the disposal storage location becomes full, notify the Project Manager.
- Under direction from the Project Manager, items identified for disposal will be itemized on an ASU Property Relocation Authorization (PRA) form. Any ASU Property Control tagged item must be clearly logged on the PRA form. Non-tagged items should be identified by a general description and need not be detailed.
- Frequent monitoring of the disposal storage location will be performed by TS&D student support staff with reports to the Project Manager with the status of the location.

Note: *A workstation or server will be capitalized reflecting component cost only and not labor.*

LOCATION	TYPE	ITEM	QTY	VENDOR	COLOR	CODE	ROOM	SHELF
Classroom1	**Case**	Hon Hai 7C443-115 ATX Case, With P4 Power Supply, Black Color	30	BCD2000	GREEN	1	telcom 217w	floor
Classroom1	**CPU**	AMD Duron 1ghz OEM	30	BCD2000	GREEN	2	116	6
Classroom1	**CPU Fan**	Coolermaster Universal Fan	30	CoolerMaster	GREEN	3	117	6
Classroom1	**Floppy Drive**	Teac FD235HFA29 1.44MB	30	BCD2000	GREEN	4	117	6
Classroom1	**Hard Drive**	Western Digital 20gb ATA100 7200rpm	30	TPI	GREEN	5	117	6
Classroom1	**Keyboard**	Belkin Classic Keyboard (black)	30	Mwhse	GREEN	6	117	8
Classroom1	**LAN**	Intel Pro/100 S Desktop Adapter w/3DES 168-Bit Encryption	30	TPI	GREEN	7	117	8
Classroom1	**Monitor**	Planar FWT1503Z	30	Solutions4Sure	GREEN	8	Telcom 206E	
Classroom1	**Motherbd**	ECS K7SEM-266	30	TPI	GREEN	9	117	7
Classroom1	**Mouse**	Logitech Optical Mouse	30	TPI	GREEN	10	117	8
Classroom1	**RAM**	512mb PC133	30	TPI	GREEN	11	117	6
Classroom1	**Security Lock**	Hex Nut	30	TechSaver	GREEN	12	117	6
Classroom1	**ZIP**	Zip 250 & mounts	30	BCD2000	GREEN	13	117	7

Sample inventory sheet including grayed received items

Receiving Labels



CLASSROOM

PAC

WLIBBOOT 1 & 2

WLIBDB

WLIBPDC

WLIBTRIS

WWW 1 & 2

Room 117 Storage

2nd Floor West Closet

Network Background

In November of 2000, the Library and ASU West IT began working on an overhaul of the network topology and equipment used in the Library building. Key issues were security, reliability, integration, and expandability. With the completion of the redesign, the systems and network design used in E3 was able to proceed. Included within this section is the original design worksheet describing the details of the new network. Diagram N-4 is a representation of the topology of the new design.

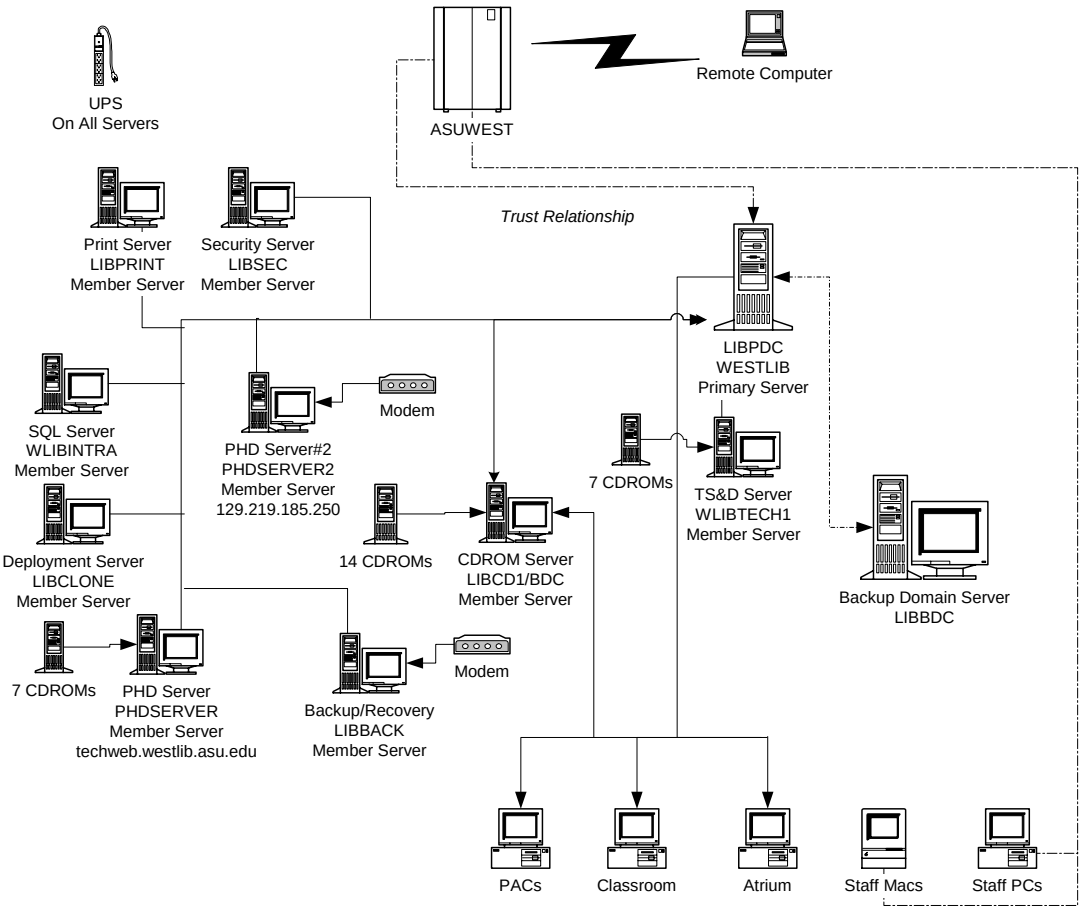
Systems Integration

E3 servers and delivery services use a combination of static and dynamic IP host addressing. All servers use static addresses. PAC and Atrium client workstations use DHCP served addresses. The diagrams N-1 and N-2 describe the server service changes in the Library network from the old 2000-2001 design to the new E3 2002-2003 design. Diagram N-3 describes the separation of file system and authentication services in the new design.

Additional Nodes

During the E3 project, Classroom workstations will be replaced with their new hardware. Eight of the old workstations will be repurposed and deployed as additional public workstations throughout the building. Also, an additional 12 workstations will be added to the South wall on the first floor. A reduction in the numbers of networked printers in the Atrium from 4 medium output printers to 2 high output printers will take place. These new locations are reflected on diagrams N-5 through N-9.

ASU West Library
Network 2000-2001
(OLD Design- MS Windows NT)



2/01 Perry Horner

Diagram N-1

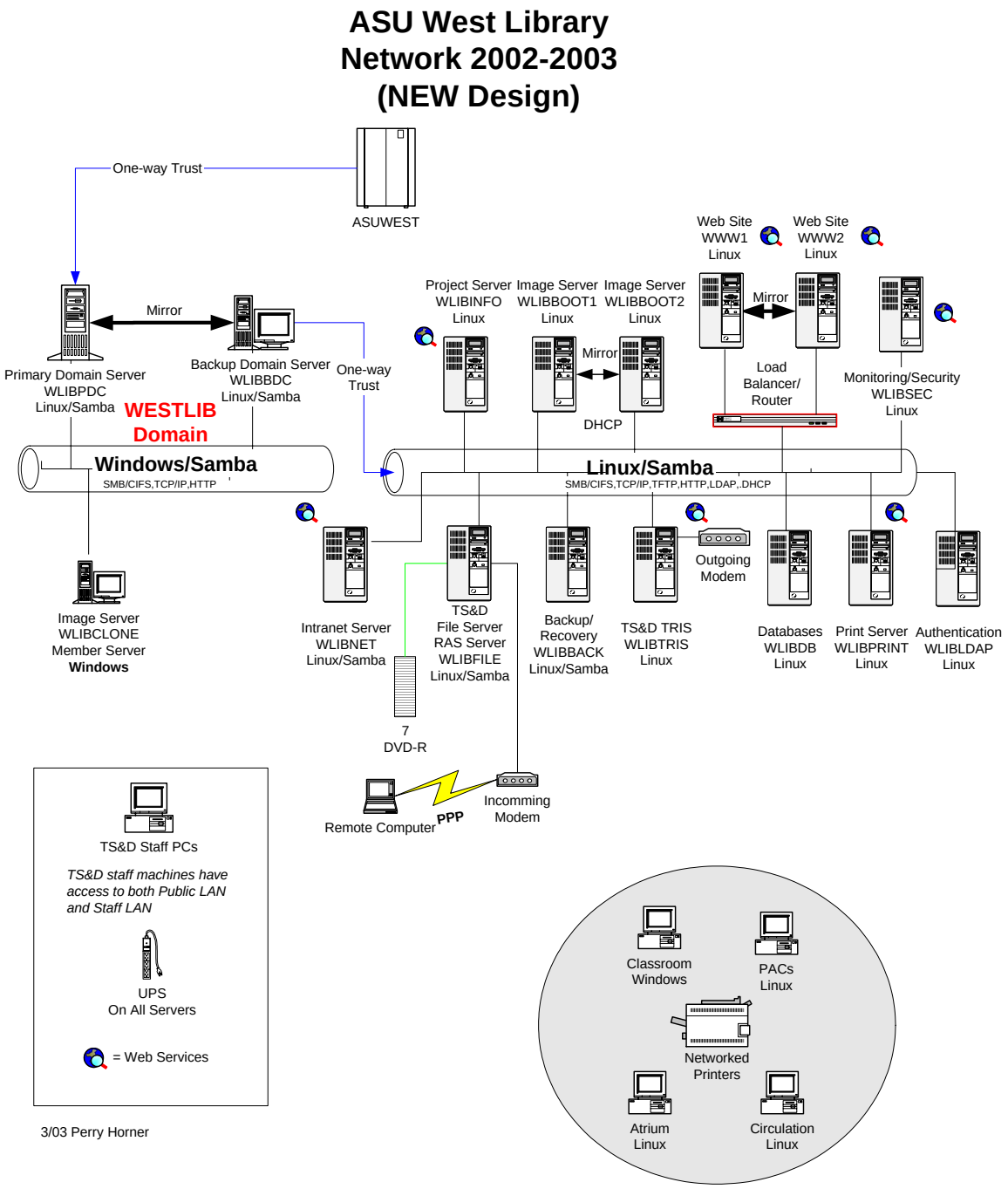

ASU West Library
Network 2002-2003
(NEW Design)
One-way Trust
ASUWEST
Web Site
WWW1
Linux
Web Site
WWW2
Linux
Project Server
WLIBINFO
Linux
Image Server
WLIBBOOT1
Linux
Image Server
WLIBBOOT2
Linux
Mirror
Mirror
Mirror
Primary Domain Server
WLIBPDC
Linux/Samba
Backup Domain Server
WLIBBDC
Linux/Samba
One-way
Trust
WESTLIB
Domain
DHCP
Load
Balancer/
Router
Monitoring/Security
WLIBSEC
Linux
Windows/Samba
SMB/CIFS,TCP/IP,HTTP
Linux/Samba
SMB/CIFS,TCP/IP,TFTP,HTTP,LDAP,.DHCP
Image Server
WLIBCLONE
Member Server
Windows
Intranet Server
WLIBNET
Linux/Samba
TS&D
File Server
RAS Server
WLIBFILE
Linux/Samba
Backup/
Recovery
WLIBBACK
Linux/Samba
TS&D TRIS
WLIBTRIS
Linux
Outgoing
Modem
Databases
WLIBDB
Linux
Print Server
WLIBPRINT
Linux
Authentication
WLIBLDAP
Linux
7
DVD-R
Remote Computer
PPP
Incomming
Modem
TS&D Staff PCs
TS&D staff machines have
access to both Public LAN
and Staff LAN
UPS
On All Servers
= Web Services
3/03 Perry Horner
Classroom
Windows
PACs
Linux
Networked
Printers
Atrium
Linux
Circulation
Linux

Diagram N-2

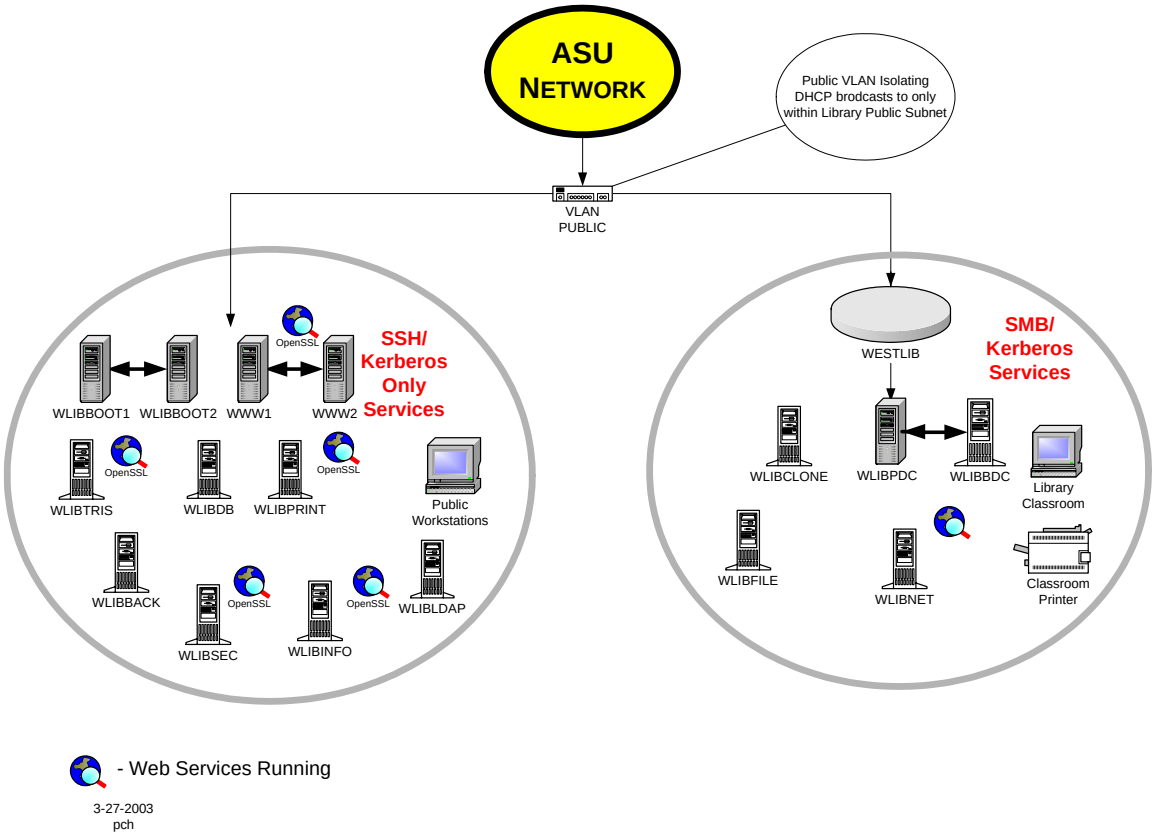

ASU NETWORK
Public VLAN Isolating DHCP brodcasts to only within Library Public Subnet
VLAN PUBLIC
SSH/ Kerberos Only Services
OpenSSL
WLIBBOOT1
WLIBBOOT2
WWW1
WWW2
WLIBTRIS
WLIBDB
WLIBPRINT
Public Workstations
WLIBBACK
WLIBSEC
WLIBINFO
WLIBLDAP
SMB/ Kerberos Services
WESTLIB
WLIBCLONE
WLIBPDC
WLIBBDC
Library Classroom
WLIBFILE
WLIBNET
Classroom Printer
- Web Services Running
3-27-2003
pch

Diagram N-3

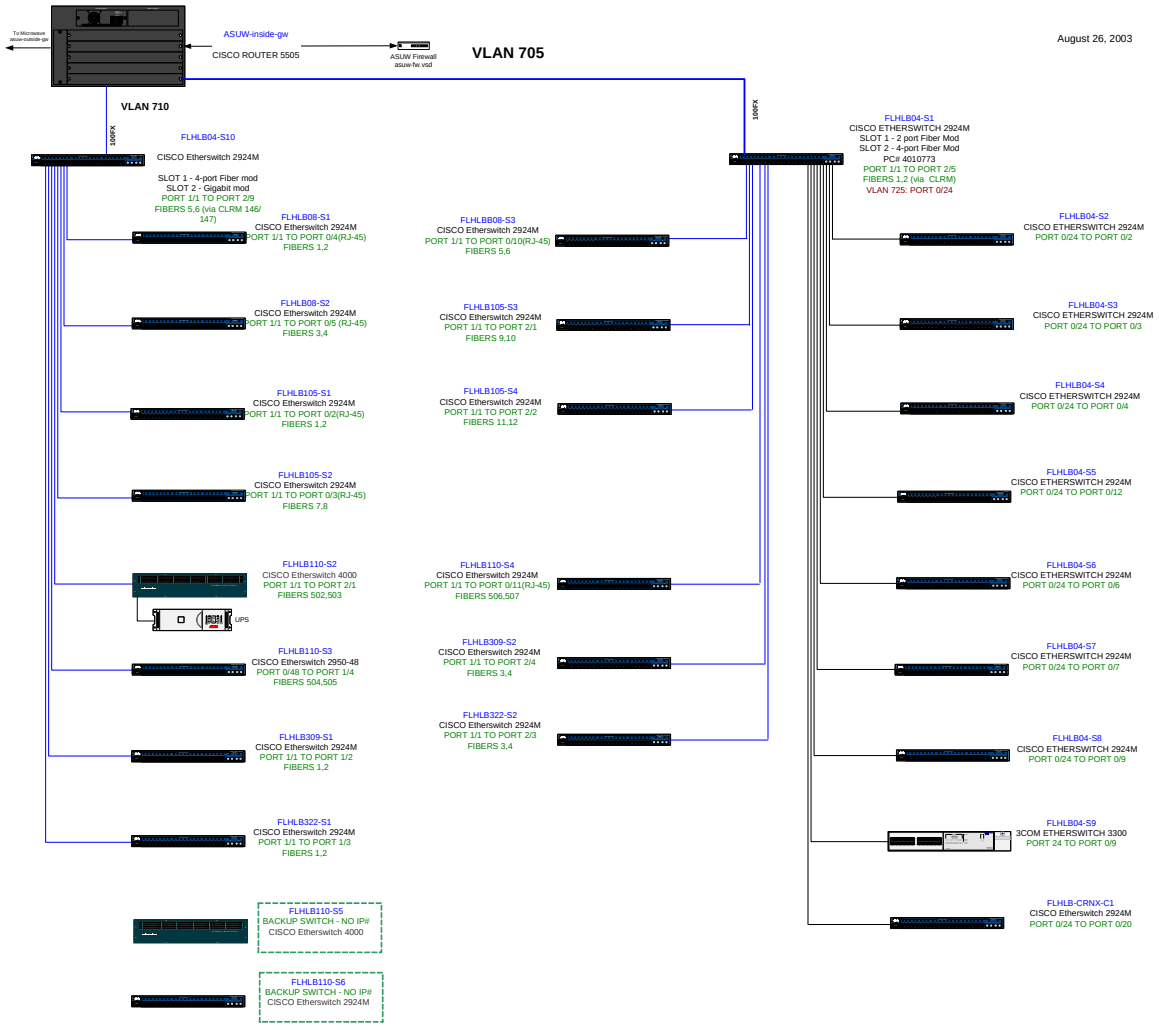

August 26, 2003
ASUW-inside-gw
CISCO ROUTER 5505
ASUW Firewall
asuw-fw.vsd
VLAN 705
VLAN 710
100FX
FLHLB04-S10
CISCO Etherswitch 2924M
SLOT 1 - 4-port Fiber mod
SLOT 2 - Gigabit mod
PORT 1/1 TO PORT 2/9
FIBERS 5,6 (via CLRM 146/147)
FLHLB04-S1
CISCO ETHERSWITCH 2924M
SLOT 1 - 2 port Fiber Mod
SLOT 2 - 4-port Fiber Mod
PC# 4010773
PORT 1/1 TO PORT 2/5
FIBERS 1,2 (via CLRM)
VLAN 725: PORT 0/24
FLHLB08-S1
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 0/4(RJ-45)
FIBERS 1,2
FLHLB08-S2
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 0/5 (RJ-45)
FIBERS 3,4
FLHLB105-S1
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 0/2(RJ-45)
FIBERS 1,2
FLHLB105-S2
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 0/3(RJ-45)
FIBERS 7,8
FLHLB110-S2
CISCO Etherswitch 4000
PORT 1/1 TO PORT 2/1
FIBERS 502,503
UPS
FLHLB110-S3
CISCO Etherswitch 2950-48
PORT 0/48 TO PORT 1/4
FIBERS 504,505
FLHLB309-S1
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 1/2
FIBERS 1,2
FLHLB322-S1
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 1/3
FIBERS 1,2
FLHLB110-S5
BACKUP SWITCH - NO IP#
CISCO Etherswitch 4000
FLHLB110-S6
BACKUP SWITCH - NO IP#
CISCO Etherswitch 2924M
FLHLBB08-S3
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 0/10(RJ-45)
FIBERS 5,6
FLHLB105-S3
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 2/1
FIBERS 9,10
FLHLB105-S4
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 2/2
FIBERS 11,12
FLHLB110-S4
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 0/11(RJ-45)
FIBERS 506,507
FLHLB309-S2
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 2/4
FIBERS 3,4
FLHLB322-S2
CISCO Etherswitch 2924M
PORT 1/1 TO PORT 2/3
FIBERS 3,4
FLHLB04-S2
CISCO ETHERSWITCH 2924M
PORT 0/24 TO PORT 0/2
FLHLB04-S3
CISCO ETHERSWITCH 2924M
PORT 0/24 TO PORT 0/3
FLHLB04-S4
CISCO ETHERSWITCH 2924M
PORT 0/24 TO PORT 0/4
FLHLB04-S5
CISCO ETHERSWITCH 2924M
PORT 0/24 TO PORT 0/12
FLHLB04-S6
CISCO ETHERSWITCH 2924M
PORT 0/24 TO PORT 0/6
FLHLB04-S7
CISCO ETHERSWITCH 2924M
PORT 0/24 TO PORT 0/7
FLHLB04-S8
CISCO ETHERSWITCH 2924M
PORT 0/24 TO PORT 0/9
FLHLB04-S9
3COM ETHERSWITCH 3300
PORT 24 TO PORT 0/9
FLHLB-CRNX-C1
CISCO Etherswitch 2924M
PORT 0/24 TO PORT 0/20

Diagram N-4

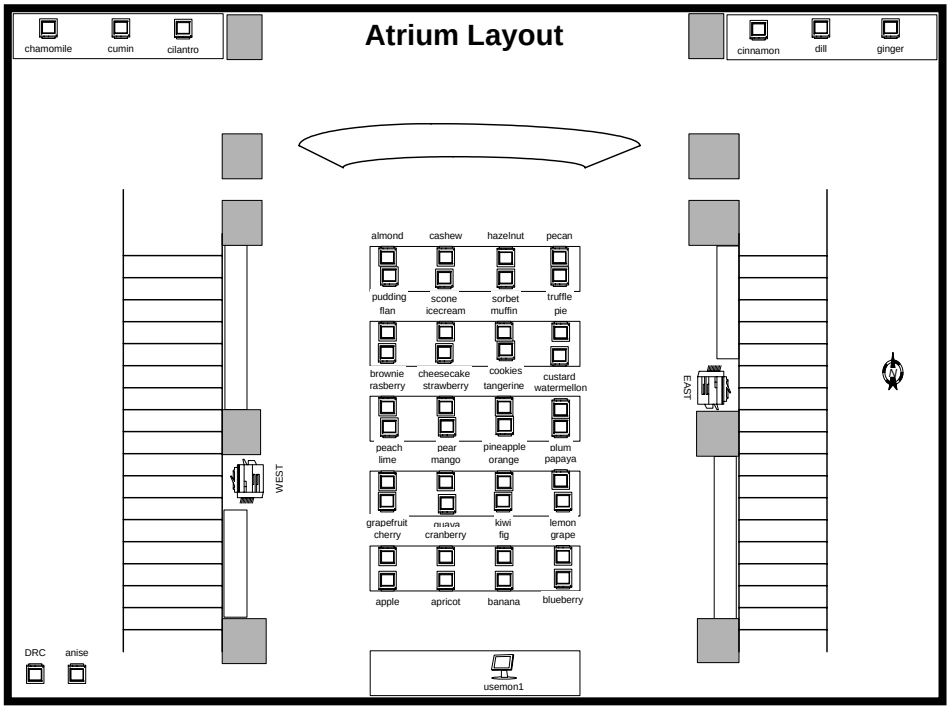


Diagram N-5

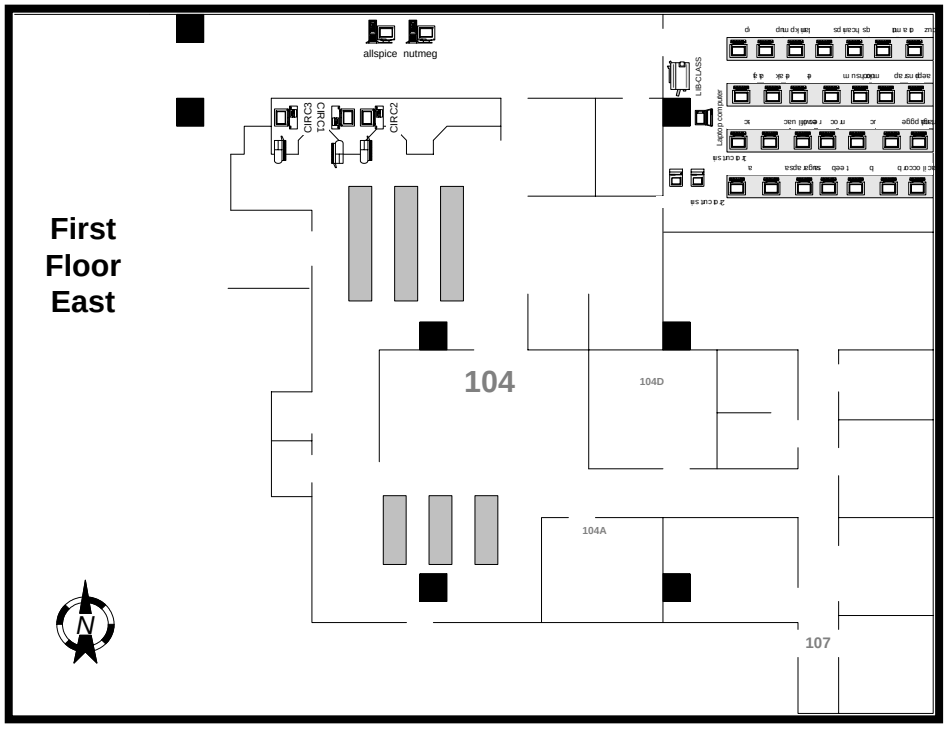


Diagram N-6

Diagram N-7

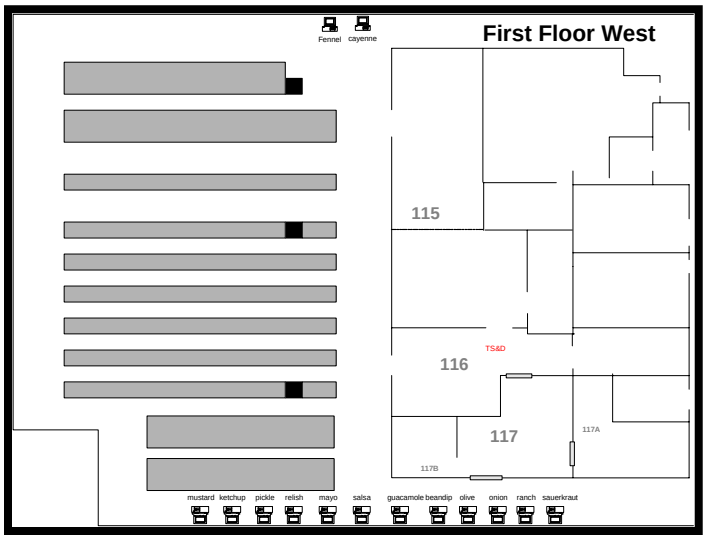


Diagram N-8

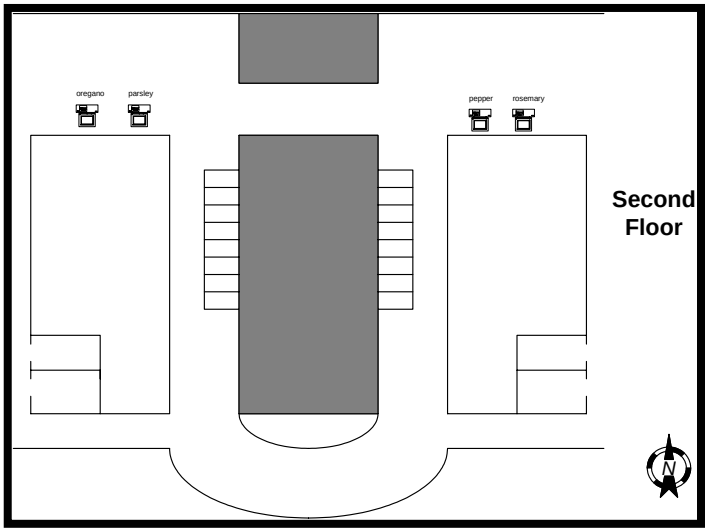
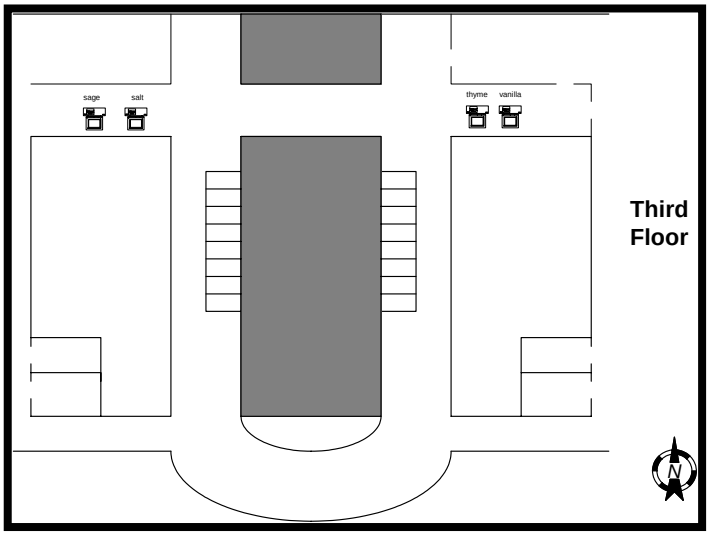


Diagram N-9



ASU West Library
Network Redesign
Prepared by TS&D on 3-14-2001

Terms Used

LibPubNet (LPN or PN)
LPN connections are used in support of the Library public service stations or LPN Hosts. These currently include the Library Classroom Student and Instructor Stations *(FLHLB100),* Circulation Checkout Stations *(FLHLB104),* 1st, 2nd, and 3rd floor Public Access Computers (PACs), Atrium Stations, and Atrium Printers, Server Room *(FLHLB117),* TS&D work areas *(FLHLB117, 117B, 116, 115, and 115A)******

LibStaffNet (LSN or SN)
LSN connections are used in support of the Library staff work. ASUW IT services these connections and the stations attached to them. These include stations in Information Access *(FLHLB 21),* Collections Access *(FLHLB104),* Reference Council *(FLHLB 107),* TS&D work areas *(FLHLB 117, 117B, 116, and 115)******, Academic Program Support *(FLHLB301),* and the Administrative Offices *(FLHLB317).*

****** *TS&D areas will have dual ports (one to staff segment, the other to Public segment) designated by colored jack*

Desired Elements

Logical

- LPN use single subnet
- LPN and LSN be separate VLANs:
    - Eliminate Broadcast Traffic between areas
    - Allow non-broadcast traffic to pass between VLANs
    - Port filtering of duplicate (Campus/LPN) services to prevent conflicts
        - Fault tolerant filtering
            - Filter at FLHLB demark for LPN VLAN ports
            - Filter at LPN demark vertical cable ports to FLHL demark
            - Filtering at LSN demark of LPN services
            - Example: Blocking of DHCP
                - *LSN has access to campus DHCP but LPN DHCP is blocked both at LPN demark and LSN demark*
                - *Campus has access to campus DHCP but LPN DHCP is blocked both at LPN demark of FLHLB demark and vice versa*
    - Layer 3 switching on FLHB04-s1 Etherswitch (129.219.167.143)

        - Expedite non-broadcast traffic between LPN & LSN
        - Reduce traffic to and from ASUW-gw
    - Layer 3 Switching on LPN demark Switch Stack?
        - From Campus side of LPN demark, LPN is seen as a single VLAN
        - LPN demark segments LPN into internal VLANs
            - LPN Servers or PDCs and BDCs on separate VLAN
                - Isolates non-server LPN hosts from Active Directory Broadcast traffic
                - Isolates non-server LPN hosts from server to server broadcast traffic
                - Port filtering
                    - Ports necessary for operation of LPN Hosts allowed
                    - Ports used in remote administration allowed only from within server VLAN, and from TS&D and West IT hosts
            - Network hardware on VLAN
                - Port filtering
                    - Ports used in remote administration or monitoring allowed only from Datacom, LPN server VLAN, and from TS&D and West IT hosts
                    - Would not affect console ports
            - Allow for segmentation of LPN Host areas into VLANs for load balancing and security as needed and coordinated through West IT/Datacom

Hardware

- Switched Ethernet
    - All sizable LPN Host segments use switches to increase collision domains
- Separate Media
    - LPN on Separate media for LSN and other networks with FLHLB from Library demark or ASUW-gw
        - All new horizontal cable reflect projected bandwidth needs over 1 decade: CAT5e
        - Wall jacks on LPN and LSN designated by color, differentiated from each other and other networks within FLHLB
        - All LPN and LSN jacks punched down as 568b standard
        - Preference for rack mounted, vs. wall mounted equipment in MDF/IDFs
        - Elimination of wall mounted punch downs in favor of rack mounted, CAT5e rated patch panel
        - Elimination of ALL bare-wire patch wire in favor of CAT5e Patch Cable

        - Elimination of unused punch-downs and bare-wire
        - Elimination of cages in favor of secure, front and rear accessible network cabinets with transparencies for observing port status
            - Preference for mounting cabinets with sides to wall for front and rear access for Datacom
                - Alternatively mounting cabinets on swing-out hinges to provide front and rear access for Datacom
            - Location of cabinets within library closets to be done in such a way as to maximize usable storage space for library
    - FLHLB110 is preferred location of LPN MDF
        - Main switch stack located in MDF
        - Implementation of IDFs in locations other than existing telecom closets
            - As is determined likely to significantly reduce the cost of re-wiring and future upgrades/changes in host location
            - As would allow for a more adaptable topology in FLHLB100 and Atrium
            - As can be provided securely
            - As will not hinder the normal work flow of staff and public areas
        - Implementation external conduit considered preferable
            - As is determined likely to significantly reduce the cost of re-wiring and future upgrades/changes in host location
            - As would allow for a more adaptable topology in FLHLB100 and Atrium
            - As can be provided securely
            - As will not hinder the normal work flow of staff and public areas
                - *Example; Library Classroom*

        Here, a drop floor would be ideal but is not fiscally feasible. Exterior conduit in this room would accomplish the same goals as a drop floor and enhance classroom operation.
        - Elimination of under utilized IDFs
            - If minimal cable runs can me made to alterative IDF
            - If considerable cost savings can be experienced thereby
        - Use of Gigabit Ethernet preferred over fiber for vertical wiring
            - If considerable cost savings can be appreciated over fiber
            - If cost savings allows for multiple (fault tolerant) runs over fiber
            - If distances permit
            - If potential for interference is not significant and STP is not an option
    - Use of cost effective equipment with consideration for compatibility and manageability
- Old Media

- Some existing media, to certain areas, should remain in such fashion that it could be attached to campus, and remain separate from LPN and LSN
  - Areas:
    - Each Atrium desk – 5 runs
    - Classroom – 2 runs
    - Upper levels, each floor, each wing – 4 runs
  - One such run would provide network access for the DRC station located in the Atrium
  - Other runs would remain inactive but available for similar station implemented in the future

Fault Tolerance

- Use of fully redundant (spanning tree capable) network hardware preferred
  - Secondary preference for network hardware with fully redundant features
    - To ensure delivery of service on a per area basis
    - Areas:
      - Server Room *(FLHLB117A)*
      - Atrium Stations and Printers
      - Classroom (FLHLB100)
      - Circulation Checkout Stations *(FLHLB104)*
      - 1st floor PACs West Wing
      - 1st floor PACs East Wing
      - 2nd and 3rd floor PACs West Wing
      - 2nd and 3rd floor PACs East Wing
      - TS&D *(FLHLB117, 117B, 116, 115, and 115A)******
- Use of locally conditioned, redundant, and uninterruptible power in MDF and IDF's
  - When cost effective
- Use redundant media
  - When cost effective
  - Provide fault tolerance by area

Network Usage

- LPN numbers 107 permanent hosts and 3 – 6 developmental/test stations at any one time.
  - Host may include 15 -20 servers and developmental/test stations with multiple fault tolerant, load balancing NICs.
  - Public Access Hosts number 88 with physical accommodations in place for an additional 12 stations
    - Hosts authenticate to Westlib PDC and BDC(s); WinNT 4.0 Domain (to become Win2k)
    - Automated reset of stations every 15 inactive minutes requires authentication

- Application in use tracking every 15 minutes to each work station
- All host have access to certain applications via VNC session where application runs on server and host remotely controls server and application
    - This is done to accommodate non-networkable applications over the network.
- Hosts print through Westlib print server
- Total public print page count for FY1999-2000: 1,468,075
- Hosts are scanned multiple times per day for hostile software: Viruses, Trojans, etc.
    - Scanning performed by Westlib Security Server
- Host activity 95% internet based
    - Access to campus DNS services is constant
    - Large amounts of .pfd downloads
- Host will migrate to a network served boot image system
    - May involve several downloads to LPN Hosts on weekly basis, perhaps daily, perhaps with each reboot
    - Each download in excess of 350mb, as high as 600mb
- Host will access JAVA based collection system at Hayden Library.

o Servers have numbered as high as 16 and as low as 12 with modification to server farm design over recent years.

- Servers will migrate to Gigabit Ethernet NICs
- New servers on order already come with built-in 1000bT
- All critical server data backed up within server farm daily
- Domain controllers, database, web and other servers replicate data to each other, within the server farm constantly

o Test Hosts

- Maybe test host/server or both
- Constant revisions to test host configurations are accompanied by constant back-up of test host image to server farm
- Nature of test host may require simultaneous access to server farm and isolation for campus network, and even the remainder of LPN

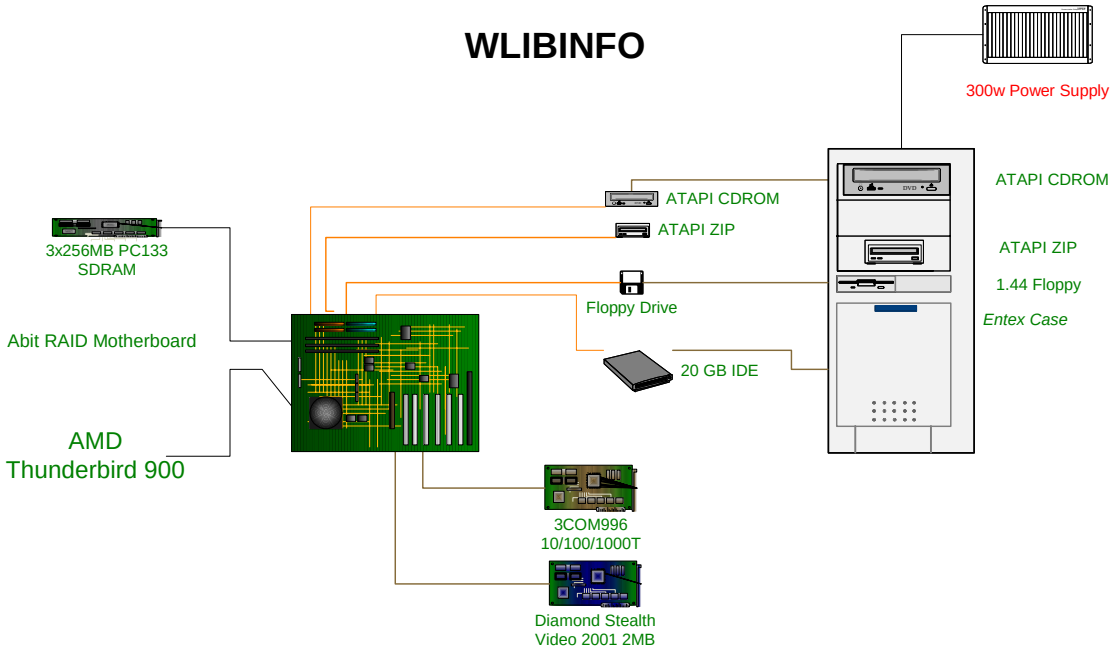
Network Update – October 2003

The Library Technology Support & Development department recommended a design in 2001 that it felt would satisfy our requirements. ASU Data Communications at the time did not have any experience with implementing those requirements. Therefore, the Library public machine network redesign was implemented based on ASU Data Communications recommended design.

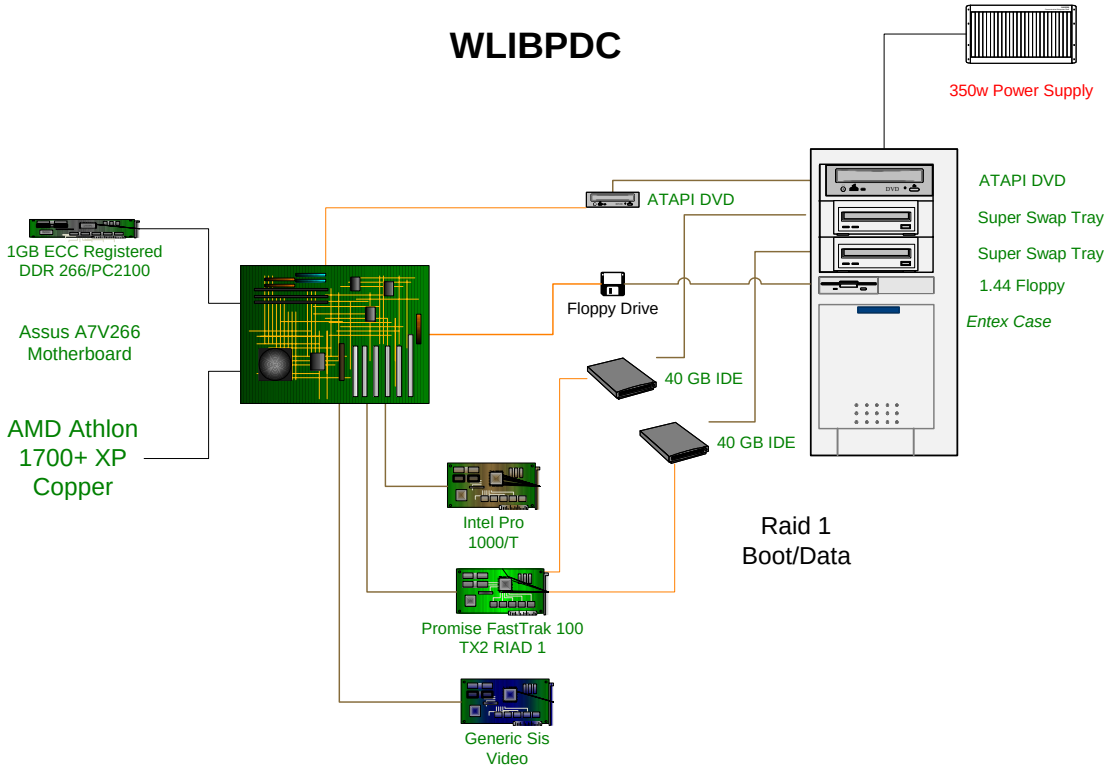
After initial implementation of both clients and servers under the new E3 architecture, it became apparent that the bandwidth requirements necessary to facilitate the workstation boot process and LDAP negotiations through X needed was significantly higher than what ASU Data Communications anticipated. TS&D recommended the use of a gigabit backplane across all 100mb switches to the fiber core switch. This allows the Cisco 4000 gigabit switch servicing all Library servers- include boot servers, to provide gigabit throughput directly through fiber to each 100mb switch serving each client workstation. The results of all lab tests indicated that this would satisfy performance requirements.

Server Overview

Server:	WLIBINFO
Purpose:	1. Provide E3 project status updates and resources 2. Provide a web portal for the ASU West Linux & Embedded Systems User Group
OS:	Linux
Services:	MySQL Apache Perl PHP
Applications:	PostNUKE portal YUM TripWire/AIDE (advanced intrusion detection environment) Webmin

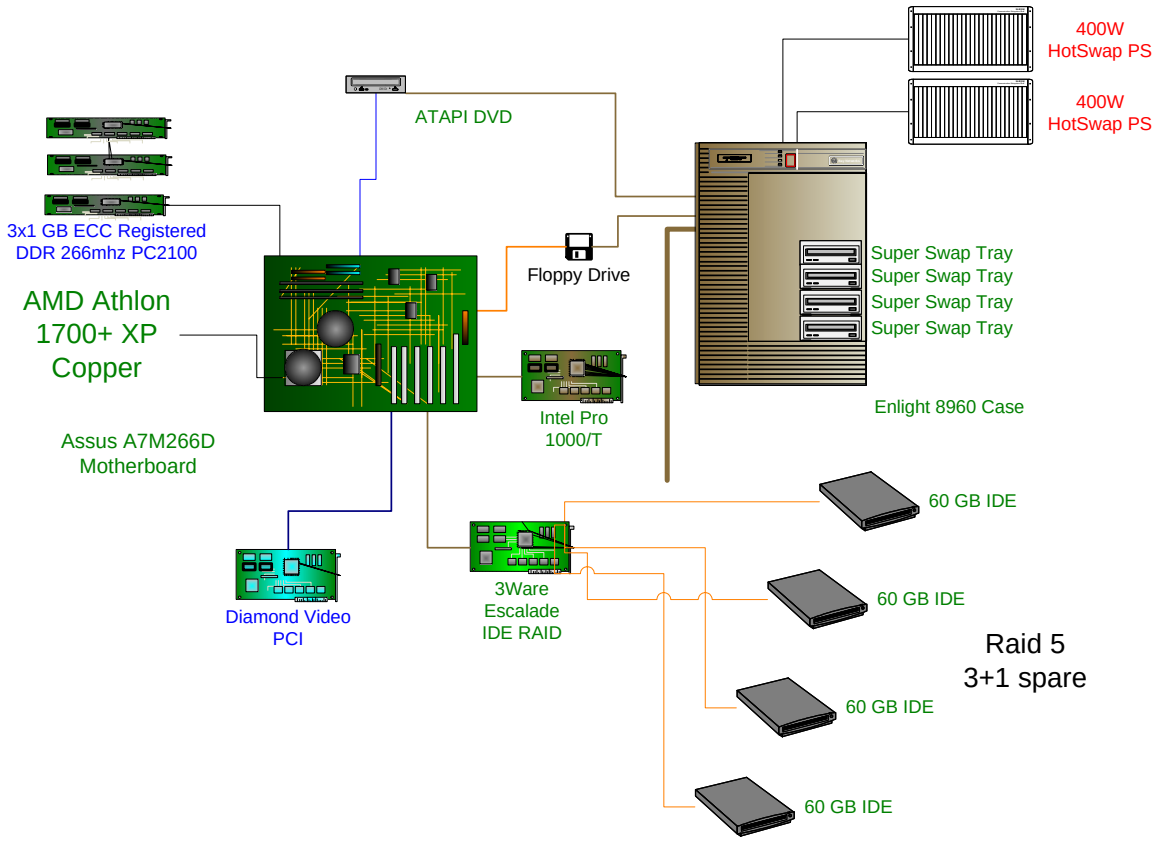


Server:	WLIBPDC
Purpose:	1. Provide MS-Windows/SMB domain accounts and services 2. Maintain existing architecture during E3 migration
OS:	Linux
Services:	SAMBA Hardware RAID 1
Applications:	PortSentry TripWire

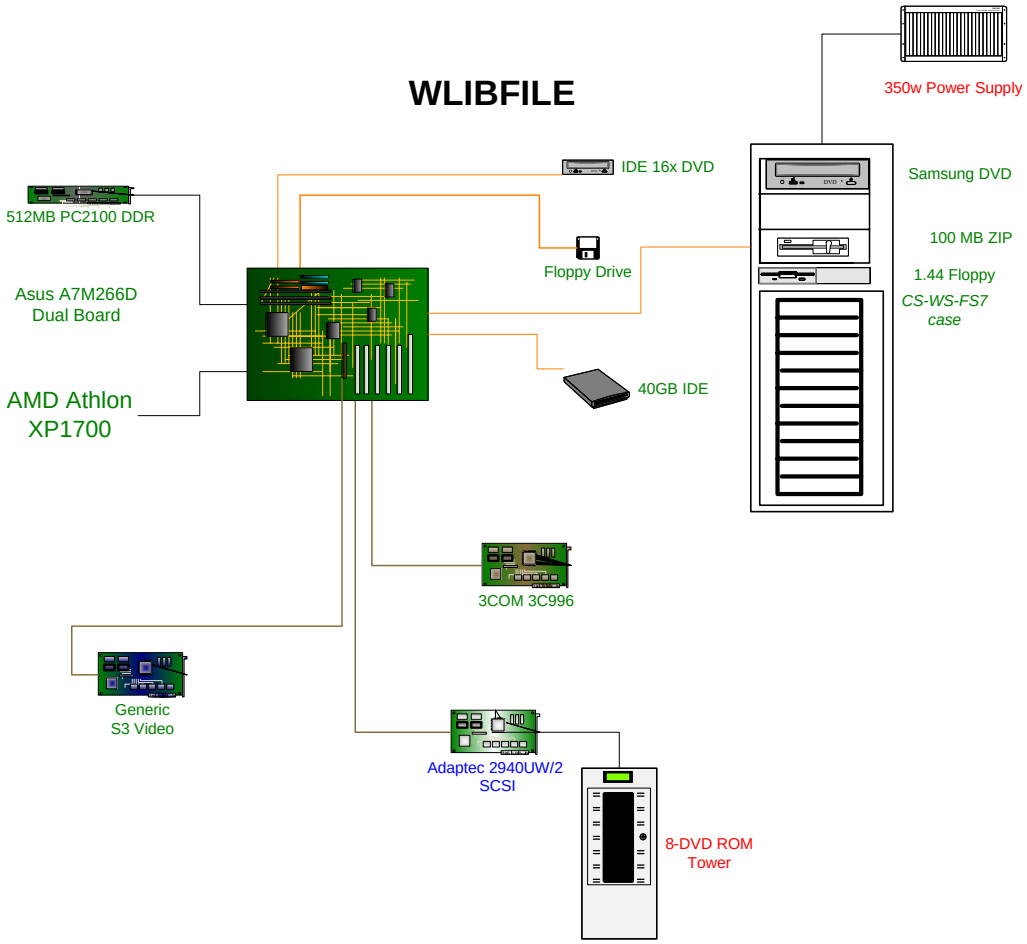


Server:	WLIBNET
Purpose:	1. Library Intranet server 2. Public access to dynamic services
OS:	Linux
Services:	MySQL Apache Perl PHP SAMBA w/WinBIND
Applications:	TripWire/AIDE PHPMyAdmin YUM

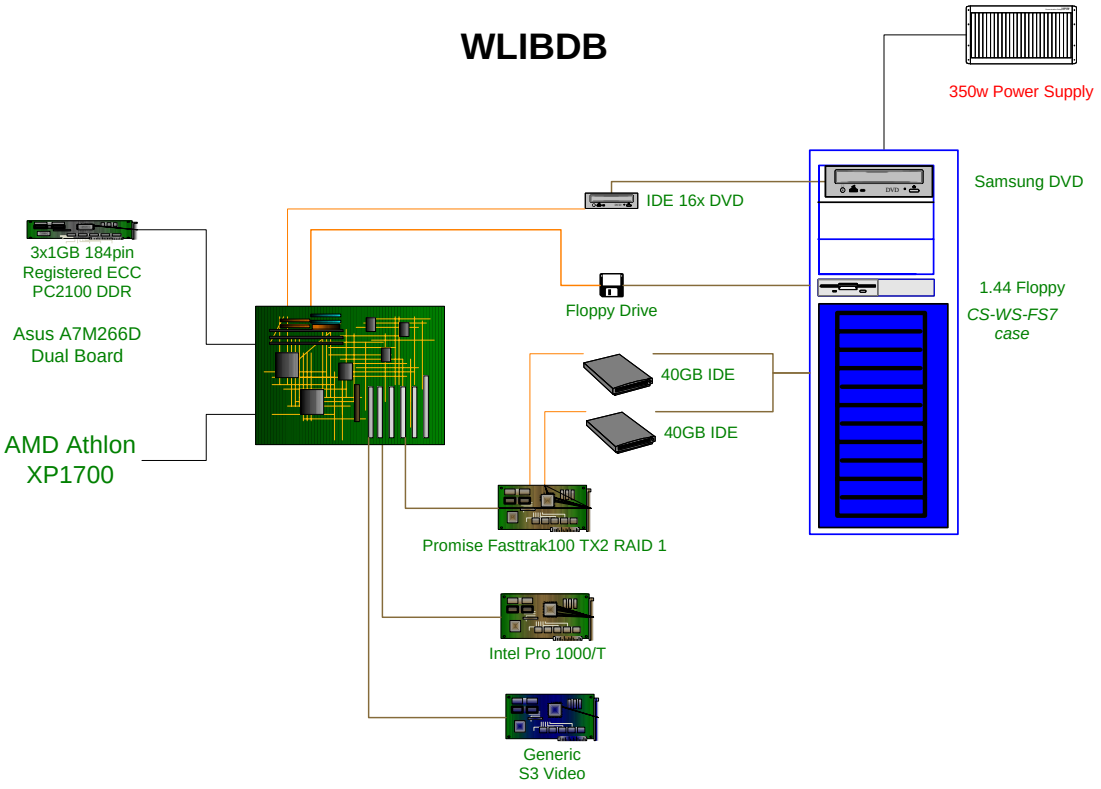
WLIBNET



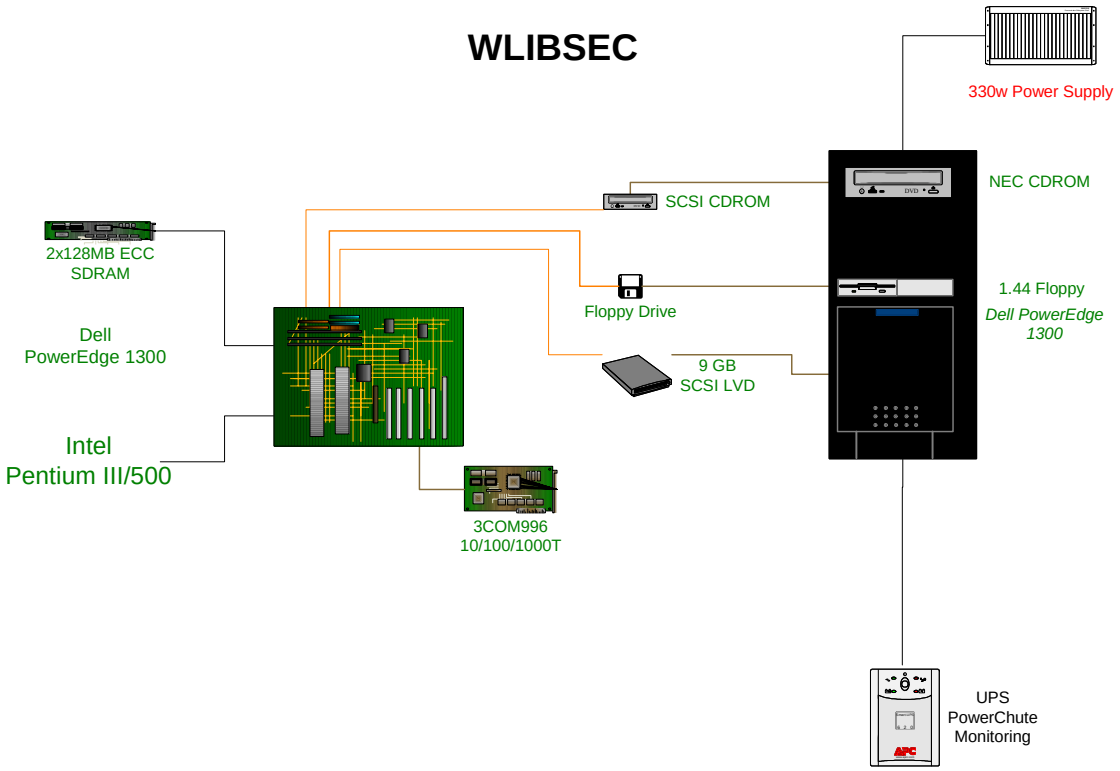
Server:	WLIBFILE
Purpose:	1. Provide file storage and retrieval services for TS&D 2. Provide archived data online for TS&D 3. Print Server for TS&D office printers 4. Provide remote dialup entry for emergencies
OS:	Linux
Services:	Samba w/WinBIND Perl CUPS RAS
Applications:	TripWire/AIDE CUPS GhostScript YUM NUT (Network UPS Tools)



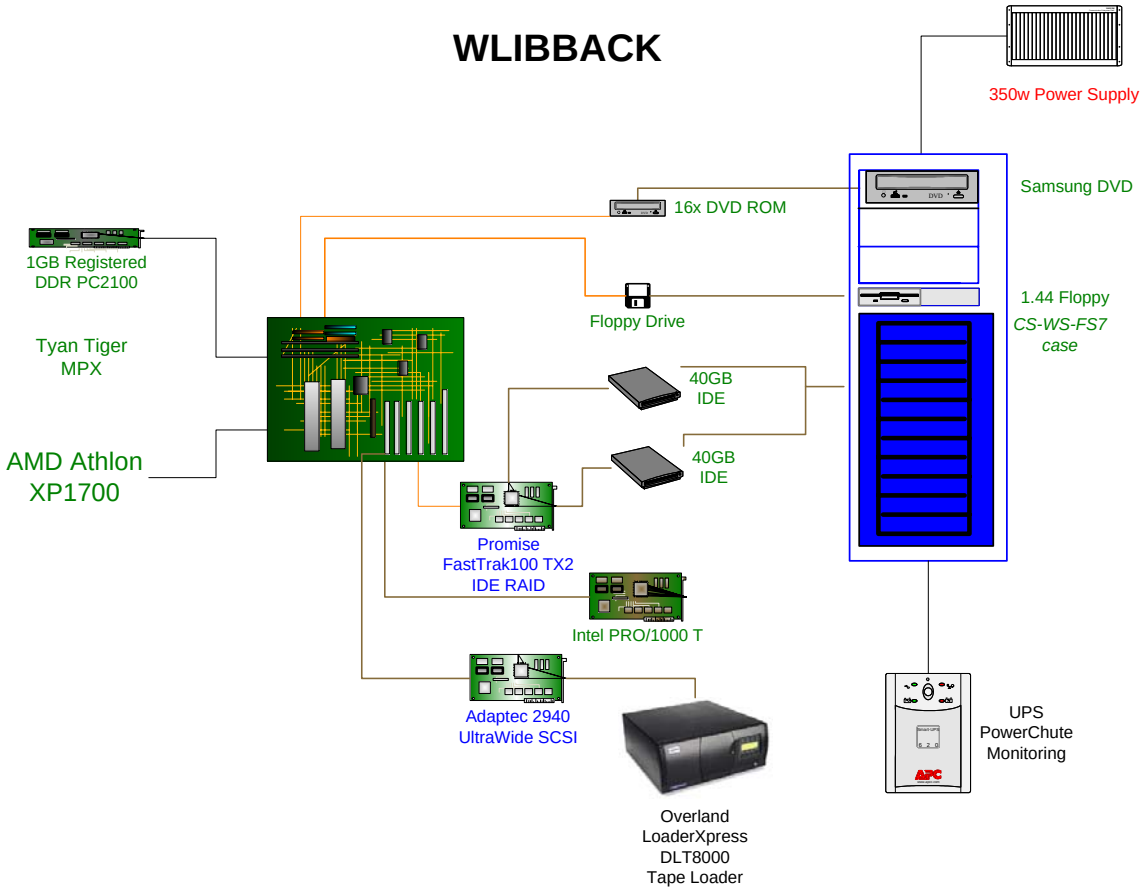
Server:	WLIBDB
Purpose:	1. Provide central database services for TS&D administrative systems
OS:	Linux
Services:	MySQL Perl PHP
Applications:	YUM TripWire/AIDE



Server:	WLIBSEC
Purpose:	1. Provide security related services for the Library public network and servers 2. Provide system security audits 3. Monitor client and network health 4. Detect and eliminate intrusions and other malicious activity 5. Monitor and alert on various port activities 6. Repository for all server log files
OS:	Linux
Services:	MySQL Apache Perl
Applications:	Nagios (formerly NetSAINT) Nessus NUT YUM TripWire/AIDE

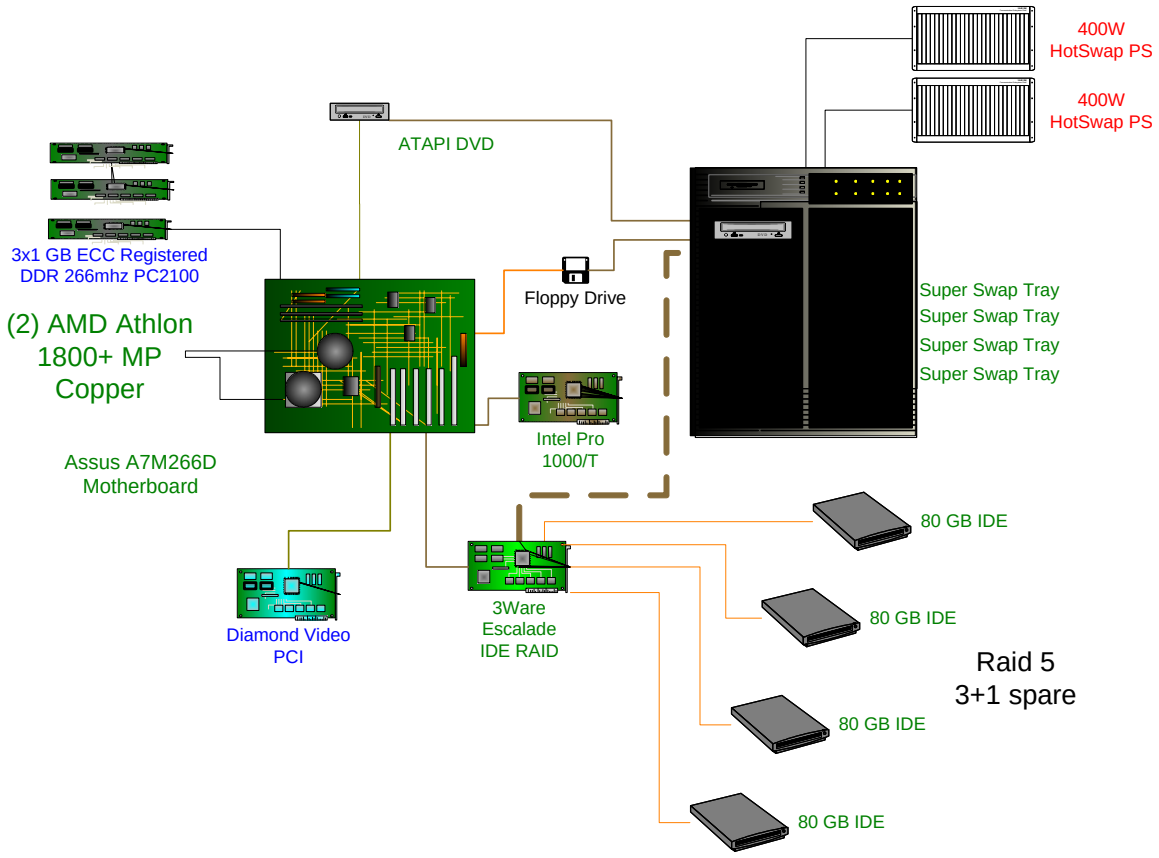


Server:	WLIBBACK
Purpose:	1. Provide tape backup services for all servers
OS:	Linux
Services:	NovaNET Unlimited Enterprise
Applications:	NovaNET NUT YUM Tripwire/AIDE

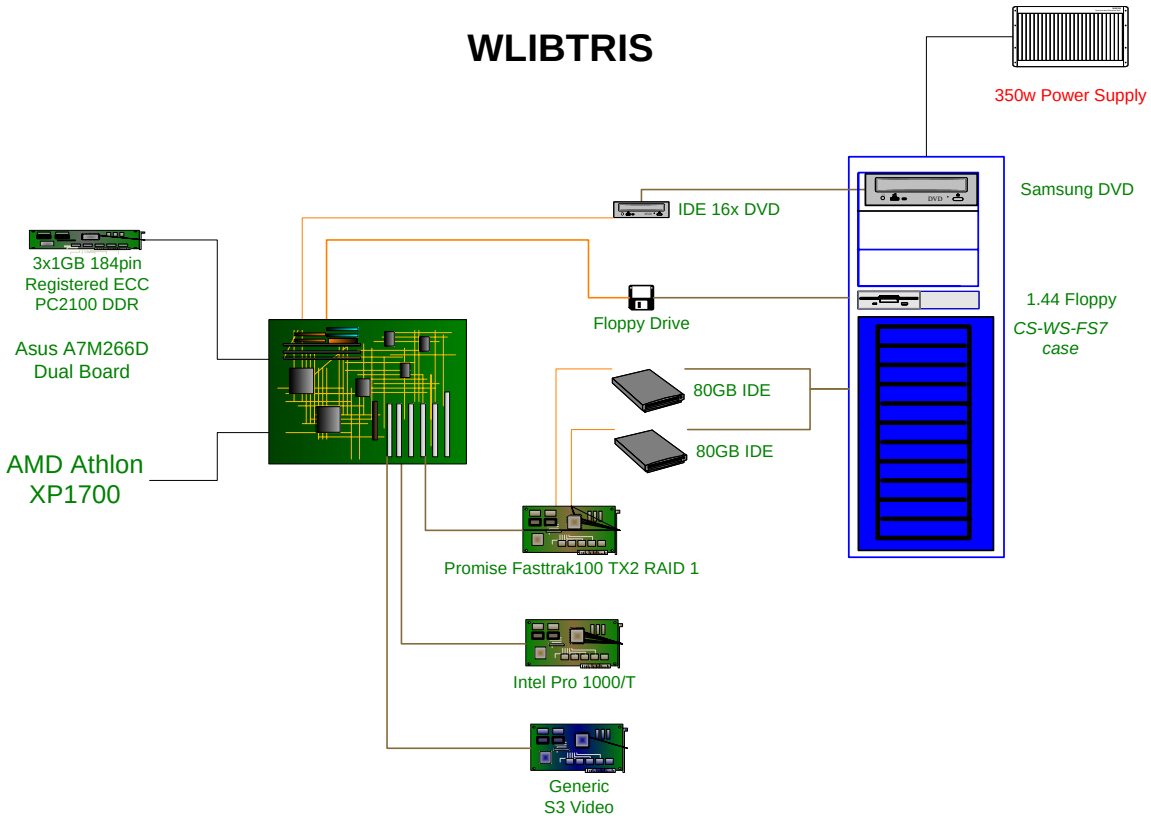


Server:	WLIBBOOT #1 & #2
Purpose:	1. Provide network client boot process 2. Provide client image downloading 3. Ensure high-availability of client resources
OS:	Linux
Services:	PXE Boot DHCP TFTP RSH
Applications:	YUM NUT TripWire/AIDE Rsync

WLIBBOOT

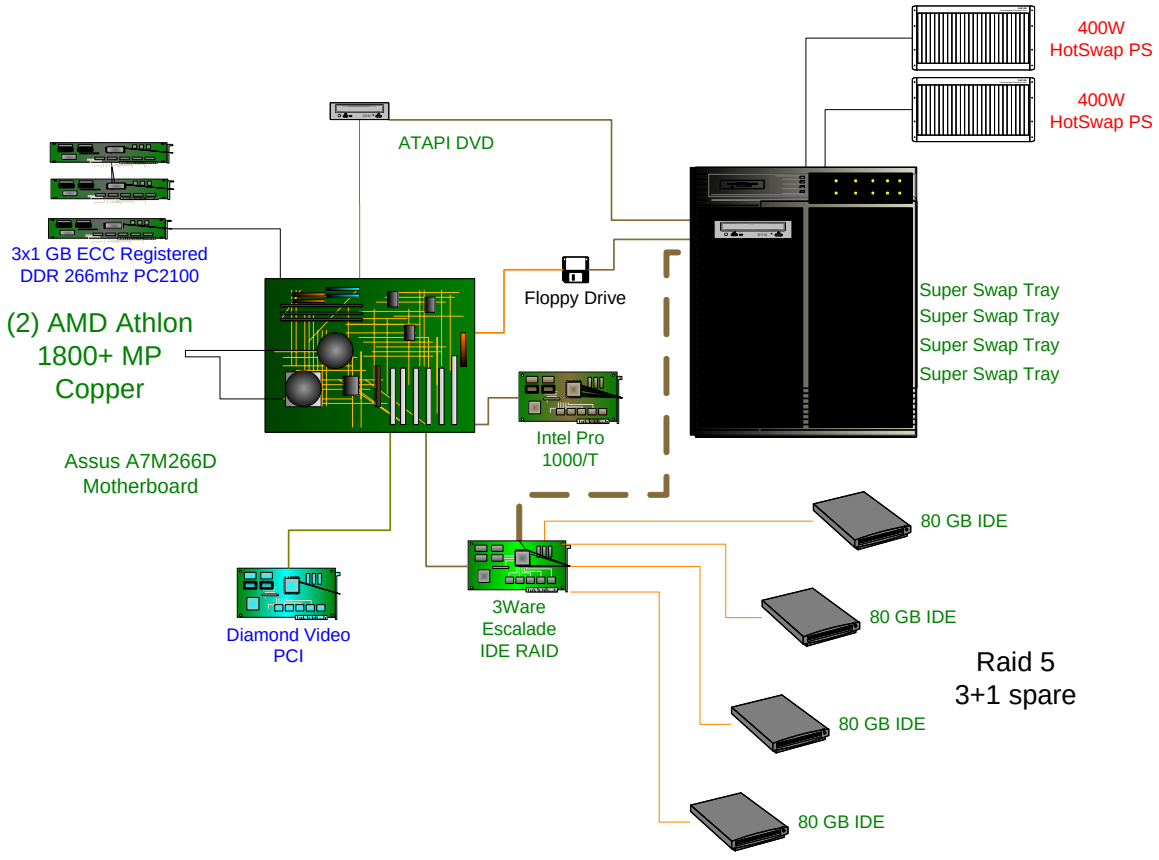


Server:	WLIBTRIS
Purpose:	1. Provide internal Library trouble reporting 2. Provide management reports 3. Provide usage tracking 4. Provide scheduling 5. Provide internal Library technology information and services
OS:	Linux
Services:	Apache Perl PHP
Applications:	PHPMyAdmin YUM TripWire/AIDE PostNUKE Portal



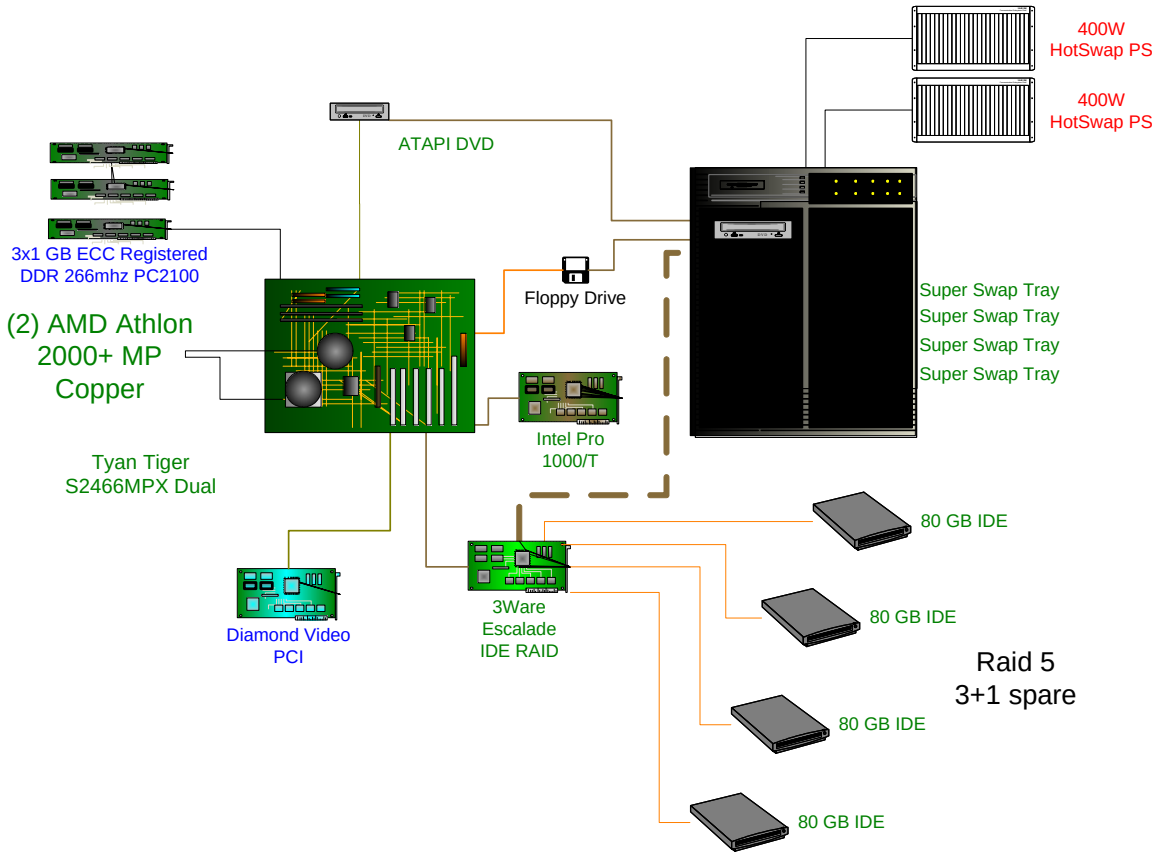
Server:	WWW1 & WWW2
Purpose:	1. Library Web Servers (Public-Side)
OS:	Linux
Services:	Apache MySQL Perl PHP
Applications:	YUM NUT TripWire/AIDE Rsync

WWW1 & WWW2

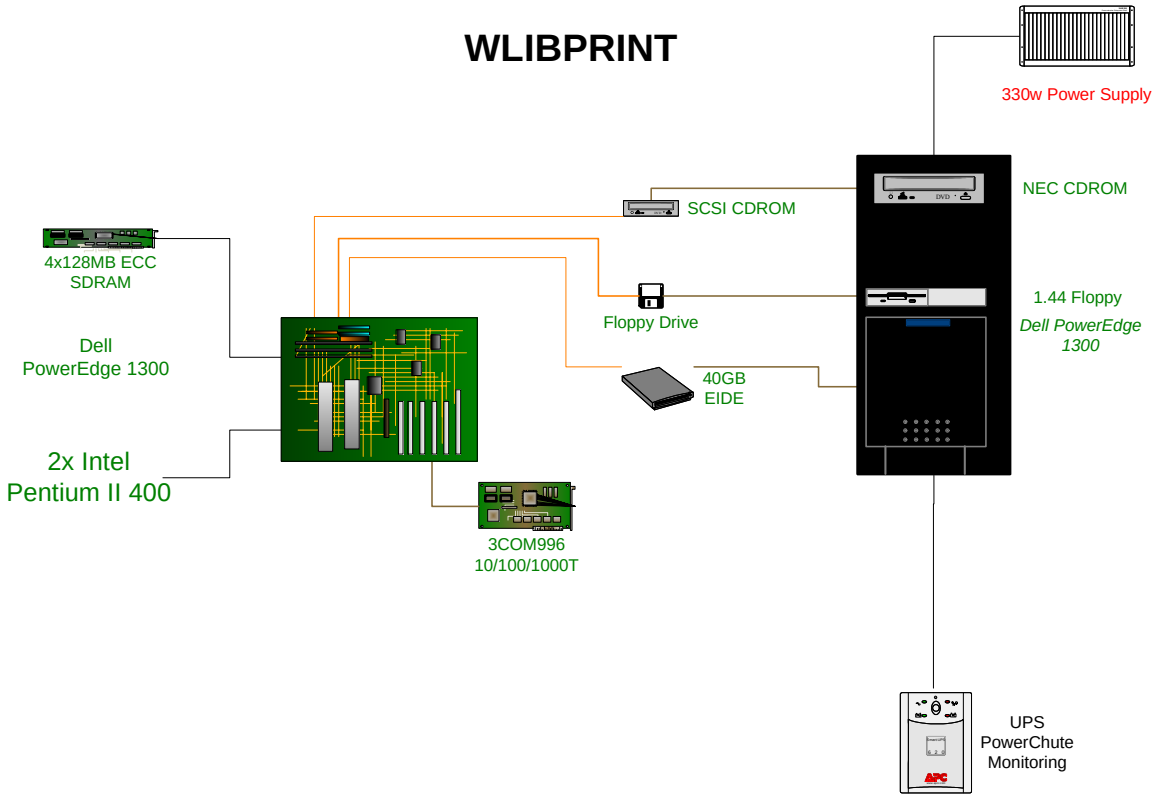


Server:	WLIBLDAP
Purpose:	1. LDAP Authentication Server
OS:	Linux
Services:	LDAP MySQL Perl
Applications:	YUM NUT TripWire/AIDE

WLIBLDAP



Server:	WLIBPRINT
Purpose:	1. Temporary Print Server
OS:	Linux
Services:	Perl
Applications:	CUPS GhostScript NUT YUM TripWire/AIDE



Client Public Machines

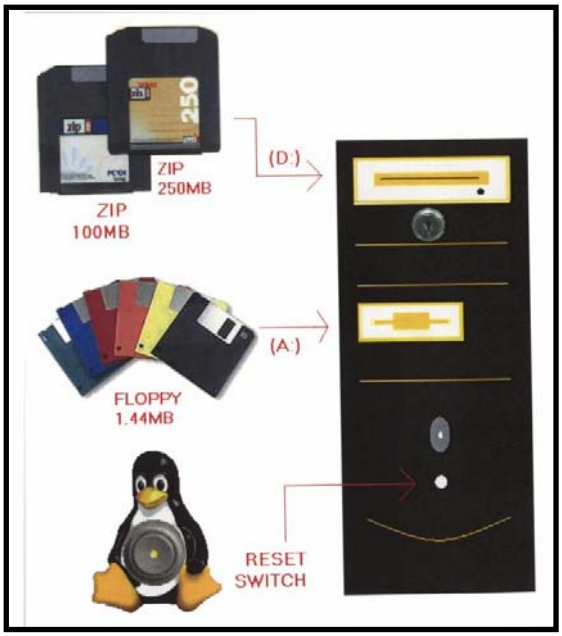
Client machines were designed to take advantage of remote image booting. The method chosen for E3 utilizes remote discovery, appropriate boot loader selection, RAMdisk creation, OS image downloading, and client interface execution. For troubleshooting purposes, each client station reports its system log to a system log-caching server. The Library has a Public Interface Team that designs the "look and feel" user interface. TS&D then develops and implements the interface based on guidelines and criteria set forth by the Public Interface Team.

Environment

Server:	PXE Linux server TFTP server DHCP server
Client:	no hard drive 512MB RAMdisk root + 256MB RAMdisk swap + 256MB system RAM PXE boot enabled NIC

Hardware Interfacing

Each client workstation allows the user to read and save to both Iomega ZIP and floppy disk removable media. These media devices have permissions set to deny Execute requests. A patch to the Linux kernel called *AutoMounter* allows a user to insert and remove these media at will. Any writing to the devices takes place immediately and does not reside in a RAM cache. The user also can press the RESET button on the workstation faceplate. This will start a warm reboot. The user cannot use the POWER button. This has been disabled through the use of a key-lock switch on the 5 ¼ bay faceplate.



The following pages describe the desktop interface, tools, and processes used in the custom image.

Client:	Circulation Workstations
Purpose:	1. Provide transaction processing to the III system via a Java client interface 2. Produce printed receipts from each transaction
OS:	Windows NT (June 2002 – May 2003) Linux (June 2003-)
Services:	Power-up via wake-on-LAN Power-down via remote SSH shutdown instruction
Applications:	Internet Explorer web browser (June 2002 – May 2003) Modified Mozilla (June 2003-) Java Runtime Environment

Client:	Classroom Workstations
Purpose:	1. Provide students with a web interface to library online services in a controlled instructional environment
OS:	Windows NT (June 2002 – May 2004) Linux (June 2004-)
Services:	Power-up via wake-on-LAN Power-down via remote SSH shutdown instruction
Applications:	Internet Explorer web browser (June 2002 – May 2004) Modified Mozilla (June 2004-)

Client:	PAC/Atrium
Purpose:	1. Provide users with a web interface to library online services and the means to retrieve, store and synthesize the information gathered
OS:	Windows NT (June 2002 – May 2003) Linux (June 2003-)
Services:	Power-up via wake-on-LAN PXE boot for image retrieval RAM disk used for OS storage, speed and security Power-down via remote SSH shutdown instruction
Applications:	Internet Explorer web browser (June 2002 – May 2003) Modified Mozilla (June 2003-)

Customizing the Client Desktop

Logon Screen

The logon screen contains a background bitmap image that is 1024x768x16 in resolution. This image can be customized. It can also be replaced with a single color background. The logon screen also displays a logon prompt window. This window displays a graphic, a welcome message, the name of the workstation, and prompting for Username and Password. The graphic and welcome message can be customized.

Initiating Logon

After a user enters a username and password, the desktop environment starts to initialize for a new session. The message graphic and associated loading environment items can be customized with a unique image.

The Desktop

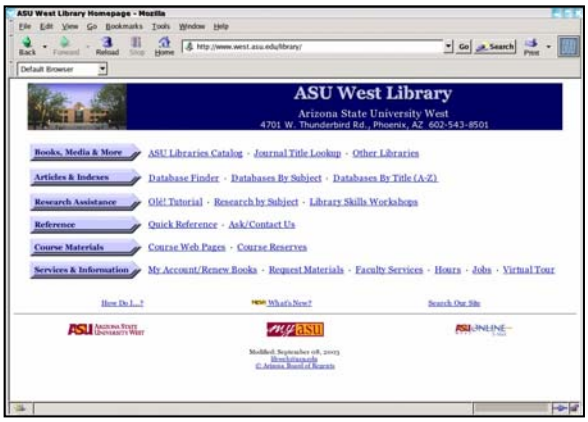
The desktop provides a user with access to both floppy and zip drives as well as the trashcan. There is a toolbar at the bottom of the screen where the user can access applications and switch around between two virtual desktops. The background bitmap image can be customized. It also can be replaced with a single color background. If an image is used, then the image can contain additional text instructions and/or images to instruct the user. If the user logged in using ASURITE, then the user will have access to AFS network space.

Toolbar

The toolbar has a button to OPEN a WEB browser. Additional applications can be added. A LOGOUT button is located here. The bar includes two virtual desktop workspaces that are miniature representations of the content on each desktop. The user can quickly switch between desktops by clicking the mouse on a desktop workspace. A clock is located in the rightmost end of the toolbar. The application buttons and the virtual desktop workspace buttons can be located anywhere along the taskbar. The clock can be changed to 24-hr time, analog clock, as well as the date format can be changed. Also located on the left is a button to LOG OFF.

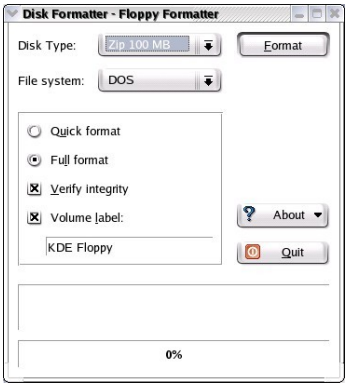
Web Browser

The Web browser used is the Mozilla.org browser. This application has been set to use the "chrome" theme. The browser has been left almost un-modified to allow the user maximum flexibility with their interactive experience. The Mail, News, Chat, and Composition Application functions have been removed.



Disk Formatting

A modified version of Kfloppy has been placed on the Toolbar for both floppy and zip disk formatting (erasing). This application supports 1.44MB 3 ½" floppy disks and both 100MB and 250MB zip disks.



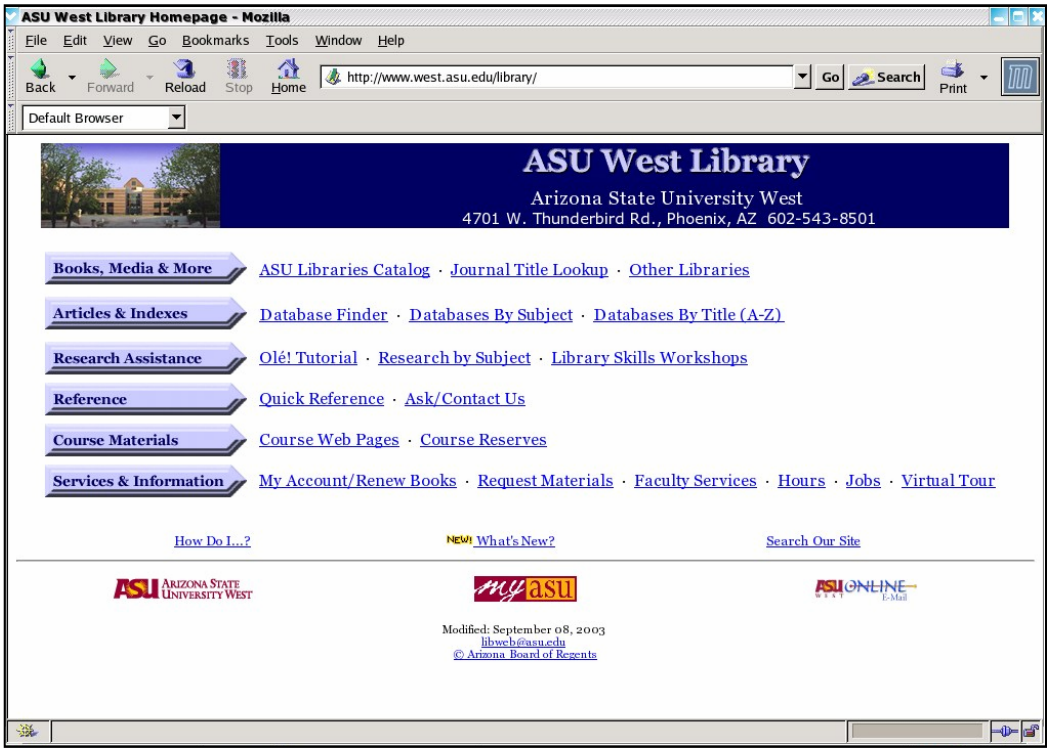
Toolbar Button Icons

The icon graphics used within the Toolbar can be customized by supplying a 32x32 pixel .png bitmap using high-color 16-bit colors. Examples of these are:

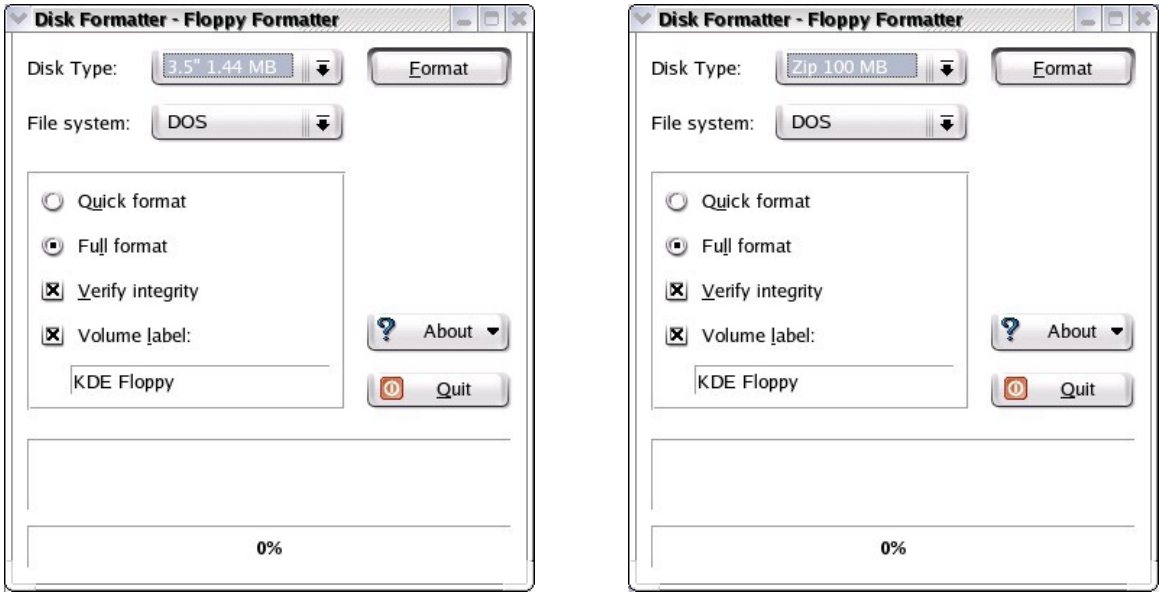
Web browser

Logout

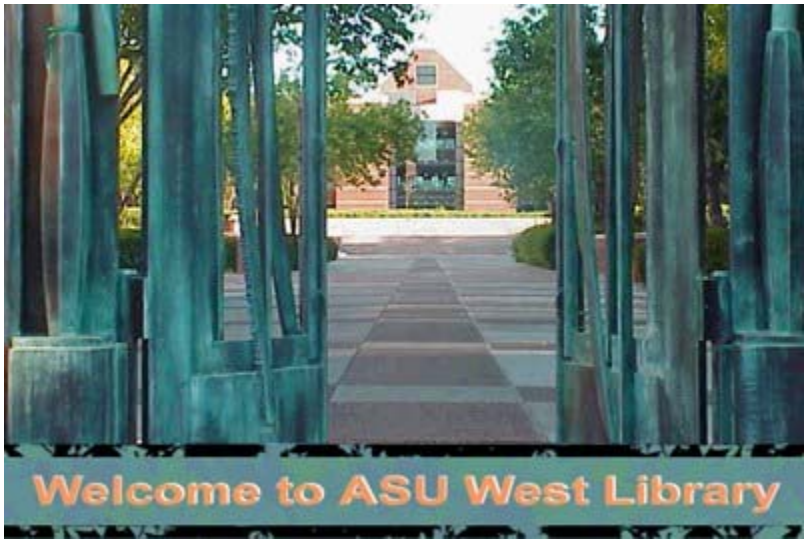
Sample Desktop



Sample Browser Screen



Floppy/Zip Disk Formatter



Logging In Splash
400x267

Web Browser Language Support

The Mozilla browser is set up to support the following languages:

- English
- Spanish
- French
- German
- Italian
- Chinese
- Japanese
- Korean
- Arabic
- Russian

Machine Names

Each workstation has a unique machine name. Names of foods are used as client machine names. These names are also used as generic user names for non-ASU user logins. Users must be able to easily retain the name of the workstation they are using if they want to retrieve printed output using the managed print system. There are approximately 100 workstations with unique food identifiers. Food names are more easily remembered than station names with numbers or abbreviations. The naming of each station with a memorable name will be useful when the Pharos Print Management system is implemented. This way a user who does not have an ASURITE login ID can log in to the workstation using the machine name for both USERNAME and PASSWORD. When the user prints to the Pharos System and goes to a Print Release Station, the user can identify themselves by the memorable station name to obtain access to their current print jobs.

PAC Station Names

(28)Library Classroom
The *Vegetable Patch*

ARTICHOKE
ASPARAGUS
AVOCADO
BEET
BELLPEPPER
BROCCOLI
CABBAGE
CARROT
CAULIFLOWER
CELERY
CORN
CUCUMBER
EGGPLANT
GARLIC
JALAPENO
KALE
LETTUCE
MUSHROOM
OKRA
PARSNIP
PEA
POTATO
PUMPKIN
RADISH
SPINACH
SQUASH
TOMATOS
ZUCCHINI

(20) Peripheral Stations
Herbs & Spices

ALLSPICE
ANISE
BASIL
CAYENNE
CHAMOMILE
CUMIN
CILANTRO
CINNAMON
DILL
GINGER
MUSTARD
NUTMEG
OREGANO
PARSLEY
PEPPER
ROSEMARY
SAGE
SALT
THYME

(12) New Stations
Condiments

MUSTARD
KETCHUP
PICKLES
RELISH
MAYO
SALSA
GUACAMOLE
BEANDIP
OLIVES
ONION
RANCH
SAUERKRAUT

(40) Atrium
Fruits, Desserts & Nuts

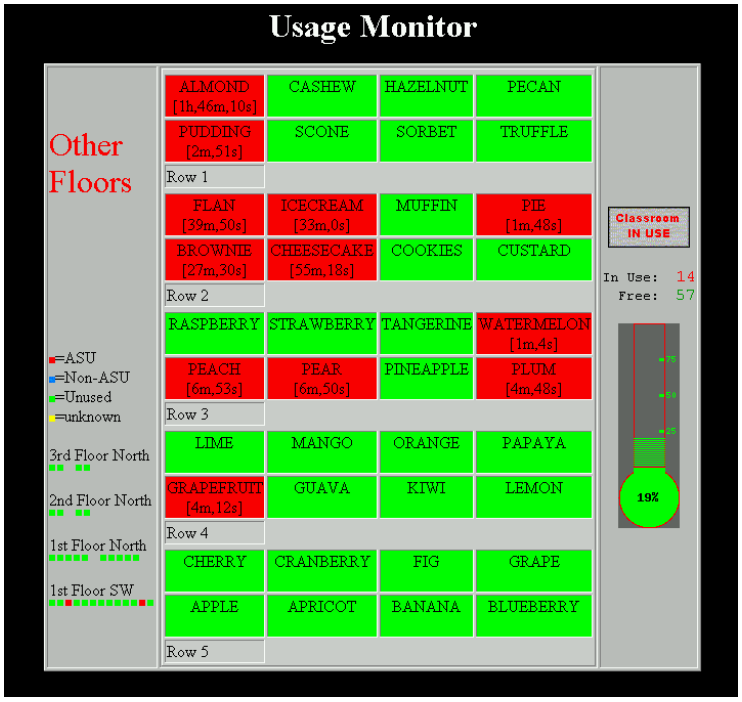
ALMOND
APPLE
APRICOT
BANANA
BLUEBERRY
BROWNIE
CASHEW
CHEESECAKE
CHERRY
COOKIES
CRANBERRY
CUSTARD
FIG
FLAN
GRAPE
GRAPEFRUIT
GUAVA
HAZELNUT
ICECREAM
KIWI
LEMON
LIME
MANGO
MUFFIN
ORANGE
PAPAYA
PEACH
PEAR
PECAN
PIE
PINEAPPLE
PLUM
PUDDING
RASPBERRY
SCONE
SORBET
STRAWBERRY
TANGERINE
TRUFFLE
WATERMELON

Client Usage Monitoring

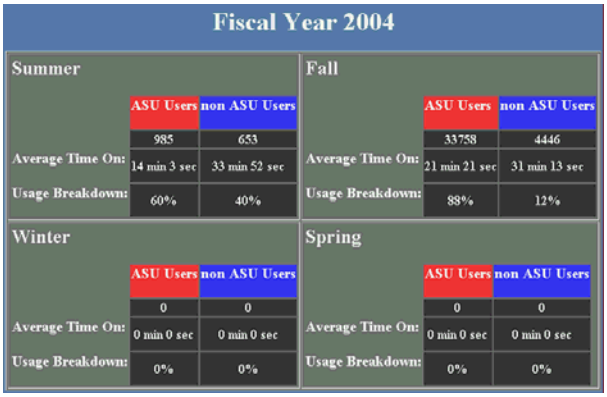
When a user logs in using either the generic machine account or an ASURITE account, a custom socket application is executed to a receiving server. The server then creates a login record in a usage database. When the client logs out, or the user's session times out after 10 minutes of inactivity using a custom logout screensaver, another message is sent to the usage server indicating a logout. The activity then is logged to the usage database. If a user did not log out but instead pressed the RESET button, when the usage receiving server receives a login message for that workstation, it checks to see if it is already logged in, if so, then it closes out that record and opens a new session record.

Usage and Capacity

The usage database is used to provide real-time information on the usage of the Library workstations. It also provides historical data for generating usage reports. The Library reference desk uses an embedded Linux workstation (NeoWare Eon 4000 model) using a Web browser to view usage/capacity in real-time. A GREEN location indicates that the station is not in use. A RED location indicates that an ASURITE authenticated user is using the station. A BLUE location indicates that the user logged in using the generic station logon- usually non-ASU users. A YELLOW location indicates that communication to that location has been broken. When a station is in use, its location on the Usage Monitoring screen includes the amount of time since the user logged on. There is also a capacity thermometer on the right side of the screen to indicate the total capacity of workstations in use. A message also displays if the Library classroom is being used.



The usage database also is used to generate real-time reports describing aspects of usage such as the number of ASU and non-ASU users who have logged on to the workstations, the average length of time using the workstations, etc.



Description of Services

Remote Boot Services

Preboot Execution Environment(PXE)

Network interface boards that support Intel's PXE ("pixie") specification in the NIC's ROM have the ability to boot from a network. To complete the requirements, a motherboard needs to have BIOS which supports a network bootable device. The beauty in using a PXE service for booting is in the simplicity in execution. A client workstation does not need to have a hard drive since the remote booting can also allow for a remote filesystem and storage devices. Diagram S-1 describes the processes involved.

Dynamic Host Control Protocol (DHCP)

The boot servers offer DHCP services for providing each client workstation with an IP address. A workstation requesting a DHCP address lease will be challenged by the server against a list of MAC (Media Access Control) addresses. The list contains MACs which can be granted a lease along with the machine name, DNS, subnet, and gateway addresses.
Any workstation requesting a DHCP lease which is not on the MAC list will be denied an address. All DHCP leases expire after 18 hours from issuance.

Trivial File Transport Protocol (TFTP)

The boot servers also provide TFTP services. During the PXE boot process and following a valid DHCP lease session, the client workstation connects to a TFTP server and requests a boot image file. The file is transferred to the client workstation and the boot process continues on the local machine using the downloaded file or files.

Redundancy With High-Availability

Two boot servers share the boot request services through distributed load balancing and fail-over. Each server has a list of primary/preferred clients. If the services are not available to a client from it's primary server, the other server will receive the request and fulfill it.

Security

Security is managed using a combination of allowable MAC addresses and intrusion detection software. Although a MAC address can be spoofed, the client boot image is matched to the unique hardware of the Library Public Access workstations. This means the spoofing workstation must have the same network card, video card, RAM size, and storage devices as the Library Public Access workstations in order to function.
Tripwire Open Source Linux Edition software is used as a file and directory integrity checker. This application verifies that the server and related boot and image files are clean and free from tampering. If it finds a discrepancy, it reports the file or directory to a log along with the specifics around the discrepancy. The

signatures that Tripwire utilizes are stored in a database located on a read-only volume. This ensures the database cannot be maliciously modified by an intruder. Further, Tripwire emails alerts to Library Technology staff informing them of the activity.
Security if further strengthened by only allowing specific IP addresses access to the servers via firewall rules for the server network cards.

Logging

Logging of the various Boot Server services and activities are placed within a log volume. These logs are then replicated to a remote log server. Some rules are created around each type of log identifying the format of logging, subsequent triggers, and lifespan.

Scheduling

The Boot Servers have cron scheduling for initiating a remote Wake-on-LAN broadcast to client workstations. Every morning at a scheduled time, the servers broadcast a Wake-on-LAN to specific MAC addresses. The valid receiving workstations then power up and initiate the PXE process. In the evening, the servers initiate a remote shutdown/poweroff command to each valid workstation.

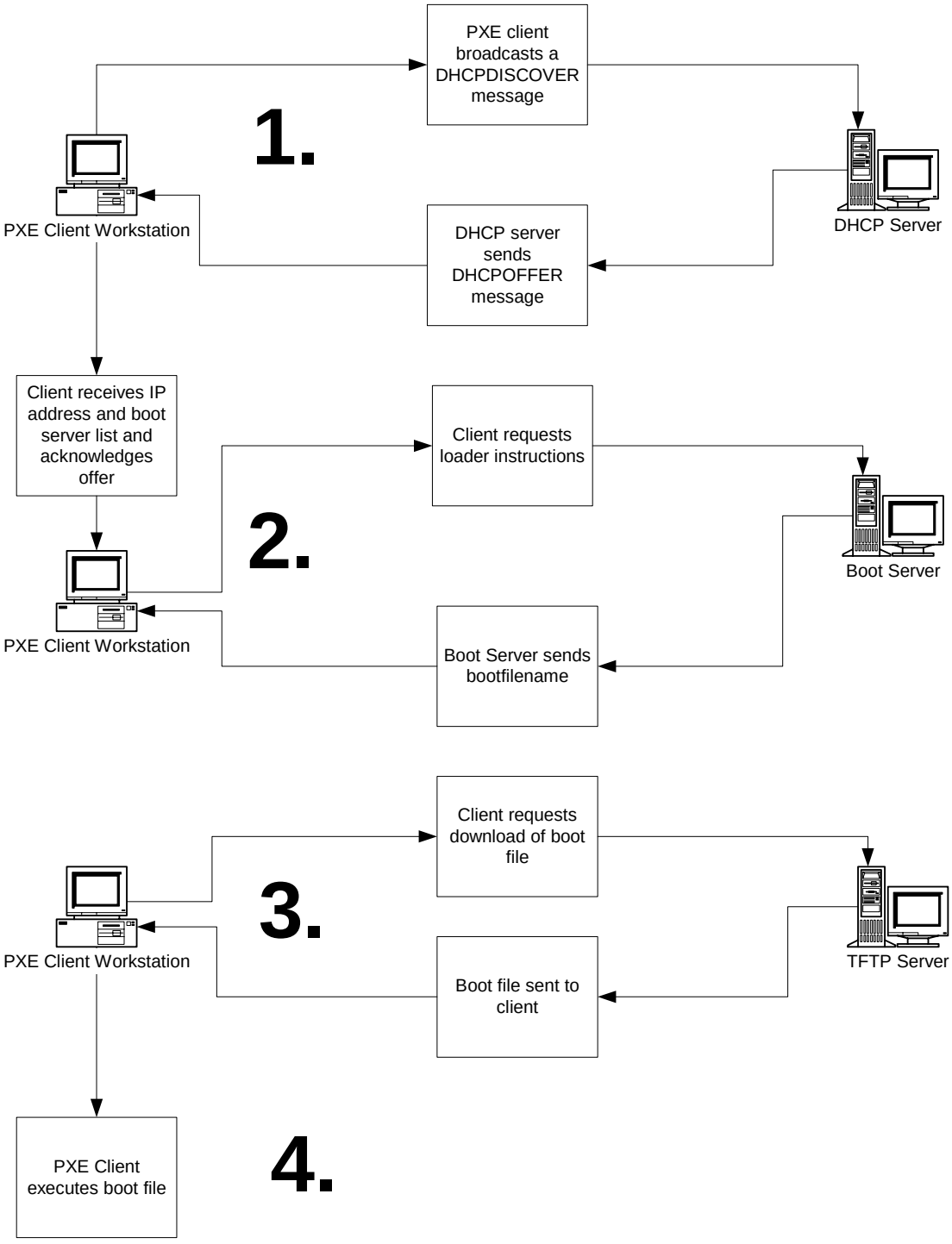

PXE client broadcasts a DHCPDISCOVER message
1.
PXE Client Workstation
DHCP Server
DHCP server sends DHCPOFFER message
Client receives IP address and boot server list and acknowledges offer
Client requests loader instructions
2.
Boot Server
PXE Client Workstation
Boot Server sends bootfilename
Client requests download of boot file
3.
PXE Client Workstation
TFTP Server
Boot file sent to client
PXE Client executes boot file
4.

Diagram S-1

Trouble Reporting and Information Services

The Trouble Reporting and Information Server (WLIBTRIS) provides Intranet access to TS&D services for Library staff. These services include operational information, statistics, guidelines, and trouble reporting facilities. In addition to Library staff services, the WLIBTRIS will also provide TS&D support staff with valuable tools and services for the TS&D operation. This server is the 2nd iteration of the TS&D TRIS. It will be operational for E3 with continued development for an additional 18 months.

New WLIBTRIS Intranet Home Page

Staffing and Responsibilities

The ASU West Library Technology Support & Development (TS&D) has the responsibility for full-service support of all equipment and services designated for Library "public" access. The areas of coverage include: public workstations, classroom workstations, classroom A/V equipment, circulation workstations, public printers, support and infrastructure servers, network topology, equipment specification, technology budget planning, strategic planning, and asset management.

T S & D Support Areas

These areas are broken down into individual components which TS&D supports

Classroom

- Create/Maintain New Images
- Help Calls
- Asset Management
- Cable Management
- Troubleshooting (Servicing)
- Software Deployment
- Instructor Station
- 24 Hour Emergency Service
- Purchasing
- Software/Hardware Deployment
- Signage/Labeling
- Layout Design
- Use Documentation
- Printer Servicing
- A/V
- Salvage
- West Media Contact
- Daily Classroom Inspection

Public Machines [Reference Council]

- Create/Maintain New Images
- Help Calls
- Asset management
- Cable Management
- Troubleshooting (Servicing)
- Software/Hardware Deployment
- Beta Stations
- Salvage
- Support Servers
- Daily Inspection of machines
- Layout/Architecture
- Use Documentation
- Printers
- Instructions
- 24 Hour Emergency Service
- System Security
- Physical Security
- Purchasing

Access Services [Circulation]

- Create/Maintain New Images
- Help Calls
- Asset Management
- Troubleshooting (Servicing)
- Purchasing
- Salvage
- Scanners
- Printers
- Software/Hardware Deployment
- Use Documentation
- 24 Hour Emergency Service
- III system printer/server

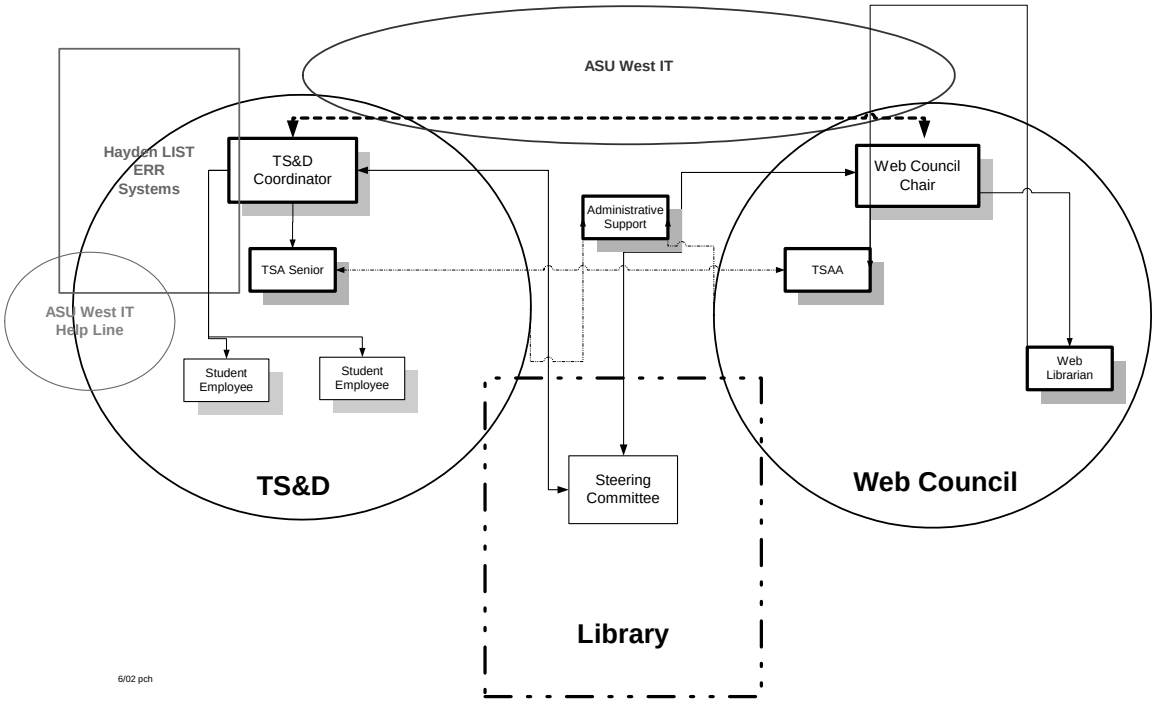
External [outside TS&D]

- DRC-Purchase Equipment (Disability Resource Center)
- Campus IT-Participate on Committees as assigned
- Report Network Problems
- Interact with campus IT on specialized Hardware/Software Specifications
- Move equipment
- Holding Facility of equipment (off-campus loans processing)
- Asset Management/Warranties
- Approve Purchases
- Recommend Non-Standards when applicable to Public Support Function
- Barcode Scanners
- Meetings
- Report Problems to LIST [Hayden Library]
- Staff Manual
- Load Library Specialized Software
- Salvage/Trade-In
- Contact Property Control
- Inter-department Property Exchange
- Special Project Consultation
- Training
- Budget Planning
- Off-Campus Loan Processing (assist Library Business Manager)

T S & D Staff Responsibilities

TS&D staff includes a mix of full-time staff and part-time student employees to cover all levels of technology requirements. Full-time staff have a large scope array of skill sets, experience, and insight in the areas of library information systems and delivery. Student employees have skills and experience in general research, troubleshooting, repair, and maintenance of equipment supported by TS&D.

TS&D Organization Integration



TS&D staff utilization has been adjusted to provide efficient and cost-effective development and support for the E3 implementation and future E3-related needs.

Job Responsibilities

Congruent with AUCCS classification description

Reports to: Library Dean

TSA Coordinator

JOB RESPONSIBILITY (in order of importance)

- Participates as a member of Management personnel as technology liaison and as technology department head in lead planning, directing, coordinating, budgeting, implementing, and creating policy and projects to affect the environment of technology in the Library. Manages daily department operations and supervises staff.
- Maintains a high degree of technical knowledge and expertise on a group of technology products and services through research, training, personal use, conferences, seminars, vendor presentations and information. Leads support for the product groups including expert trouble-shooting, advocacy, training, interfacing and publicity.
- Plans, Recommends, Specifies, Purchases, Configures, Custom Programs, Installs and Maintains server, network hardware and software, and services.
- Facilitates the use of technology in the Library by demonstrating to staff new systems and applications for possible development and implementation. The technology usually consists of products that are specialized to library services and are not supported by the ASU West Campus IT staff.
- Collaborates and teams with others throughout the campus as needed on a variety of technology and technical related support projects and issues.
- Manages public site operations.
- On-call 24hr (rotational)

Position Responsibilities Outline

TSA Coordinator

- Departmental management
- Technology architect
- Approve purchases
- Systems integration
- Prototyping
- Project management
- Public site management
- Emergency support
- Process design
- Program implementation
- Process, service, and policy documentation creation/maintenance
- Staff supervision

Primary Duties and Responsibilities

1. **Duty:** Participates as a member of Management personnel as technology liaison and as technology department head in lead planning, directing, coordinating, budgeting, implementing, and creating policy and projects to affect the environment of technology in the library.

   How: Ability to integrate information from all areas of the organization; shares expertise and special knowledge; uses project planning techniques to follow through all phases of projects; responsibilities as department head to coordinate and evaluate staff.

   Why: The library utilizes a team approach to problem solving, policy, and program development; many require input, assistance and expertise in technology related issues and projects since many of our programs and services are technology related and technology-based services and are an integral part of the library's long-tem strategic plan.

   50%

2. **Duty:** Maintains a high degree of technical knowledge and expertise on a group of technology products and services through research, training, personal use, conferences, seminars, vendor presentations and information. Leads support for the product groups including expert trouble-shooting, advocacy, training, interfacing and publicity.

   How: Reviews literature, research and investigation into systems and methodologies. Attends seminars, engages in utilizing electronic research services, contacts vendors, reps, analysts and interested researchers. Creates documentation and presentations to support these products and services. Directs technical staff on procedures and methodologies for solutions during troubleshooting phases.

   Why: To advance the use of technology in the library; use technology to increase efficiency in performance of work; facilitate library processes to support student, staff, faculty, campus and community needs.

   20%

3. **Duty:** Plans, Recommends, Specifies, Purchases, Configures, Custom Program, Installs and Maintains server and network hardware and software.

   How: Site planning and architecture design; integration of network server services through hardware and software methodologies; performing custom programming and modifications to fulfill needs.

   Why: Consistent and reliable electronic services are vital to library operations. In technical arenas-standards, protocols, selection, and design of networking services must maintain a high degree of critical attention to detail and methods to ensure fault-tolerant services in a 24/7 networking environment.

   20%

4. **Duty:** Facilitates the use of technology in the library through demonstrating for staff new systems and applications for possible development and implementation. The hardware and software consists of products that are specialized to library services and are not supported by the ASU West Campus IT staff.

   How: Test models and products; obtains resources; create presentations.

   Why: Necessary for program development; helps motivate individuals and the organization into creative/innovative uses of technology; fosters openness to change.

   5%

5. **Duty:** Collaborates and teams with others throughout the campus as needed on a variety of technology and technical related support projects and issues.

   How: Attends regular and special committees, task forces, implementation teams, and groups as member or advisor/mentor to provide expertise and skills.

   Why: Shares expertise and information with others within and outside of the library to promote collaboration and partnerships with other units. Maximizes University resources. Promotes communication and relationship skills.

   5%

Create/Maintain New Images
- Install operating system
- Install software
- Make client image
- Create client policies
- Create masters for deployment
- Create boot disk for deployment
- Update when needed

Public Help Calls
- Relayed emergencies relayed when identified
- Emergencies forwarded by TSA Sr. when needed
- Non-emergencies forwarded by TSA Sr. when needed
- Pager/cellular phone/PDA
- Report generation

Troubleshooting (Servicing)-Server, Network, Enterprise Software
- Profile/Policy connectivity
- Licensing
- Communications/Networking
- Services

24 Hour Emergency Service
- Backup to TSA Sr. for emergencies
- Point of contact for specific server emergencies
- Emergencies forwarded by TSA Sr. when needed
- Pager/Cellular phone/PDA

Purchasing
- Approve purchases
- Identify specialized items for purchase when needed
- Purchasing card purchases

  TSA Sr.: Specifications & identifications

<u>Software Deployment (Server-Server)</u>
- Load software
- Create trusts
- Create sharing
- Create replication
- Assimilate services
- Maintain currency of product

Computing Architecture
- Site planning – (hw/sw, connectivity, services, product, etc.)
- Systems integration
- Set standards
- Design computing models
- Chart connectivity and activity
- Advocate proposed changes
- Verify compatibility with other systems

Print Services
- Create/design server(s)
- Define policies
- Create connectivity design

  Automated System: statistics maintenance

Beta/Pilot Stations/Projects
- Create beta

  TSA Sr.: testing when needed

Support Servers (All)
- Create/design
- Backup/restore when needed
- Administration

  Web Server
  Security/Monitoring Server
  Site Database Server
  Domain Servers
- Document activity

  TSA Sr.: informative updates on server activity
  informative updates on public area activity

System Security
- Create/implement policy
- Ensure systems integrity
- Evaluate and implement measures
- Risk management

Networked Electronic Subscriptions
- Create/update procedures
- Point of contact with librarians

New CD Subscription
- Point of contact with librarians

  TSA Sr.: Creates service

Network Administration
- Point of contact to ASU Data Communications
- Point of contact to ASUW IT Network Services

Meetings (Internal)
- TS&D department
- Library Web Council Administration
- Library Steering Committee
- Library Supervisors Committee

Meetings (External)
- ASUW IT
- ASU Tempe Hayden Systems Forum
- ASU WWW Development Forum

Report Public Machine Service Problems to LIST
- Point of contact for Hayden LIST
- Point of contact for West Library
- Collaborate with LIST on finding solutions

Special Project Consultation
- Point of contact for Library
- Identify component needs
- Evaluate costs
- Collaborate on service integration
- Custom Programming

Training
- Provide training for all TS&D staff
- Provide training information for new systems/services

Budget Planning
- Create fiscal year operations costs
- Create fiscal year equipment costs
- Create long-term cost outline
- Present requests to Library Steering Committee

Classroom Instructor Station
- Installs, configures and maintains software and workstation image.
- Designs and deploys configuration of computer and media equipment as requested by TSD Coordinator and Library Classroom Coordinator
- Specifies purchases

Support A/V Classroom Equipment
- Design A/V equipment system for classroom

Strategic Planning
- Lead technology utilization in the Library
- Research new technology applicable to the Library
  Student employees: research activity
  TSA Sr.: research activity
- Custom programming
- Create new computer applications
- Modify/update existing applications
- Document

Project Management
- Outline new projects
- Estimate outcomes and timeline
- Monitor activity baselines
  TSA Sr.: component details & component management

TS&D Supervisor
- Authorize vacation/leave time
- Manage department operations
- Perform evaluation reviews
- Hire/terminate employees
- Facilitate Library mission
- Coordinate resource activities
- Facilitate employee conflict resolution
- Staff development
- Provide Web Council Chair with related information for staff Annual Review
- Safety awareness

Job Responsibilities

Congruent with AUCCS classification description

Reports to: TS&D Coordinator

TSA Senior

JOB RESPONSIBILITY (in order of importance)

- Plans, Recommends, Specifies, Configures, Custom Programs, Installs and Maintains specific server hardware and software
- Maintain a high degree of technical knowledge and expertise on technology products through research, personal use, vendor presentations, internal instruction, and external training. Leads in support of the systems assigned.
- On Call 24hr (rotational) Second point of contact for general problem analysis in-house (1st point on emergencies)
- Server-based database administration and development
- Interfaces with Library Web Council on Internet related projects and services
- Configures and installs designated server hardware and software
- Independent, lead, and/or collaborate work on a variety of technology and technology support projects as assigned
- Receives, analyzes, and recommends staff software requests for acquisition.

Position Responsibilities Outline

TSA Senior

- Database creation/administration
- Specialized software loading
- Web server administration
- Process documentation creation/maintenance
- Regular reports generation
- Web Council meetings
- Special projects
- TS&D Software license inventory management
- Department/operation software bug/patch monitoring
- Off-hour help call rotation
- Expert trouble call escalation
- Server library backups
- New software/hardware product specification/recommendation
- Server administration
- Network risk management

Primary Duties and Responsibilities

1. **Duty:** Plans, Recommends, Specifies, Configures, Custom Program, Installs, Administers, and Maintains server and network hardware and software. Troubleshoot systems problems.

   How: Integration of network server services through hardware and software methodologies; performing custom programming and modifications to fulfill needs. Problems require expertise for analysis and solutions.

   Why: Consistent and reliable electronic services are vital to library operations. In technical arenas-standards, protocols, selection, and design of networking services must maintain a high degree of critical attention to detail and methods to ensure fault-tolerant services in a 24/7 networking environment.

   40%

2. **Duty:** Maintain a high degree of technical knowledge and expertise on technology products through research, personal use, vendor presentations, internal instruction, and external training. Leads in support of the systems assigned.

   How: Reviews literature, research and investigation into systems and methodologies for recommendations and information to supervisor. Attends seminars, engages in utilizing electronic research services, contacts vendors, reps, analysts and interested researchers. Creates documentation and presentations to support these products and services. Directs technical staff on procedures and methodologies for solutions during troubleshooting phases.

   Why: To advance the use of technology in the library; use technology to increase efficiency in performance of work; facilitate library processes to support student, staff, faculty, campus and community needs.

   40%

3. **Duty:** Perform server-based database administration, interfacing, integration and development for Library public services and TS&D operations. Designs Internet interfacing and server-to-server connectivity.

   How: Use of a variety of design tools, database engines, server platforms, and programming languages. Utilizes stable design schemas that ensure system reliability and data integrity.

   Why: Data collection, analysis, repurposing, and storage are core functions for both public services and back office administration. Client interfacing using open-systems design promote ease of use and accessability.

   10%

4. **Duty:** Collaborates and teams with others as needed on a variety of technology and technical related support projects and issues.

   How: Attends regular and special committees, task forces, implementation teams, and groups as member or advisor/mentor to provide expertise and skills.

   Why: Shares expertise and information with others within and outside of the library to promote collaboration and partnerships with other units. Maximizes University resources. Promotes communication and relationship skills.

   10%

Troubleshooting (Servicing)-Server, Network, Enterprise Software

- Replace hardware
- Replace software
- Restore/Backup

Troubleshooting (Servicing) Support Areas

- Troubleshoot/diagnose hardware, application, operating systems, network connectivity, network service, printers and printer services, and on rare occasion bios, within the areas of public computing, and TS&D internally

Create/Maintain New Images (NT/2000)

- Install operating system
- Install software
- Make client profile for NT server
- Make policies for NT server
- Create master CDROM for deployment
- Create boot disk for deployment
- Update when needed

Help Calls

- Assign tasks as needed to complete services needed

Asset Management

- Create and/or utilize asset management databases and/or software
- Train staff in use of asset software
- Administration and maintenance of asset database(s)

Use of Technology

- Answer asset questions
- Answer questions for persons in the early stages of developing proposals
- Provide information for budgeting purposes
- Manage student research projects
- Provide continuous feedback on research results

Software Deployment

- Public area deployments
- Receipt of standard images and implementation plan from TSA Coord. and coordination of imaging process
- Tracks upgrades through vendors and campus IT recommendations
- Monitors software licenses

Software Deployment (Server-Server)

- Load software
- Create trusts
- Create sharing
- Create replication
- Assimilate services
- Maintain currency of product

Database Administration

- Load software
- Develop Databases
  Web Council: Provide specifications/requirements and function deliverables
- Implement authorities
- Create replication
- Assimilate services
- Troubleshoot/Report
- Prototype
- Maintain currency of product

Print Services

- Maintains server(s)
- Administer policies
- Maintains connectivity design
  Automated System: statistics maintenance

Support Servers (Assigned)

- Maintain/Administer Servers
- Backup/restore
- Generate reports for TSA Coordinator
- Document activity
  Informative updates to TSA Coordinator on server(s) activity

Software Development

- Develop, implement and maintain databases and web services for tasks such as Asset Management, Purchasing, Inspections, Intranet etc.
- Research new and/or beta software and analysis based on current and projected Library needs
- Provide interfaces and translation services for database integration
- Use a variety of programming languages as appropriate (C++, PERL, PHP, JAVA, etc)
- Develop custom solutions for operational needs

Pager
- Maintain pager in working condition
- Wear or be in proximity to pager at all times

Remote Computer Access
- Report of services rendered to TSA Coordinator

Analysis of problems and supplemental action
- Determine short and long term implications of problems
- Determine need for corrections to existing services in addition to emergency action taken
- Possible implementation of additional steps that may include Troubleshooting, Software Deployment, Asset Management, Software Development or other duties as noted elsewhere
- Implement corrective actions

Purchasing
- Use of purchasing card for assigned purchases

Printers
- Provide support of printer and printer services in terms of Trouble Shooting and Emergency 24 Hour Support

External Contacts
- IT-Participate on Committees
- Serve on IT planning committees as requested
- Interact with ASUW IT on Hardware/Software Specifications
- Contact IT for clarifications of recommended standards
- Render assistance with standard determination as necessary

Meetings (Internal)
- TS&D Department meetings
- Web Council
- Web Council TSAA

Meetings (External)
- Others as assigned for special projects such as Security, Reviews, etc.

Training
- Offer training and demonstrations as requested

Supervision
- Student employees when needed

Job Responsibilities

Reports to: TS&D Coordinator

TS&D Student Employees

Job Description

The TS&D student employee provides support for full-time classified TS&D staff. The role of the student employee consists of assisting TS&D staff in various tasks ranging from non-technical to technical computer work. The job entails use of computing equipment and computer terminology, movement and storage of equipment and other assets, troubleshooting and repair of computing equipment, clerk and clerical work, product research, and a variety of other tasks as assigned.

Duties

Duties include but are not limited to: research activity, collection duties, creating and deploying signage for equipment, moving inventory, inspections of classroom and public machines and deploying security solutions.

Knowledge, Skills and Abilities Required

Understanding of basic computer hardware and software operation, analytical skills, good oral/written communication skills, organization skills, independent, able to follow instructions, ability to lift 25lbs.

Risk Management

Addressing risk is as complex as designing systems. To be effective, a risk plan should describe to management the value impact, cultural impact, revenue impact, and service impact of various risk elements. Senior management and project managers must be responsible for ensuring the currency of policies and procedures in risk management. A risk management plan coupled with a contingency and communication plan can aid in reducing the impact of risks.

Categories of Library Technology Risks

External

External risks are difficult to influence. Although it may be difficult, identifying these risks allow us to manage their impact if the need arises. The following list identifies the external risks which impact the Library.

- Campus firewalls prohibits certain necessary network protocols or traffic
- ASU Authentication systems change in such a way as to invalidate E3 methods
- Government regulatory changes
- Legal issues and disputes
- Library strategy changes
- Campus strategy changes
- ASU strategy changes
- Online catalog vendor changes access and delivery methods or protocols
- Natural or un-natural disasters
- Power failure or disruption
- Intrusion, destruction, or manipulation of secured and non-secured systems
- Changes in resource and operations funding

Budget

Risks involving sources of Library revenue and expenditures are manageable to a certain extent. Unit managers can influence the factors involving risk. Senior management can put parameters in place around containing risk. The following factors identify risks that have a direct monetary relationship.

- Cost of resources exceeds identified limits
- Underestimating costs
- Shortfall of required resources

Time

Risks around time are of critical importance and can be reduced from both the granular and macro level. These risks involve all levels of the organization.

- Error in time estimations

- Overextending time investment on an issue
- Lack of required resources to meet expectations
- Unexpected events (attrition, sickness, etc.)
- Resource reassignments
- Unrealistic expectations using given resources
- Schedule changes

Operations

Operational risks involve change management and effective results. The risks can involve the lack of foresight, documentation, strategy, and communication.

- Unresolved conflicts
- Lack of authority and accountability
- Ineffective communication
- Implementation overkill
- Lack of training or orientation
- Magnitude and scope too high or too low
- Frequent role and/or assignment changes

Technology

Technology risks inherently have a broad spectrum of factors. These risks can involve a direct relationship with other risk categories. The larger macro factors are as follows:

- Use of new and untested technologies
- Integration problems
- Performance problems
- Unplanned lifecycle
- Over or under estimating requirements
- Lack of adherence to the Systems Development Lifecycle
- Product obsolescence
- Defects or bugs in hardware or software

Risk Assessment Plan

The ASU West Library Technology Support and Development department has identified and analyzed risk and the probability and resulting consequences of those risks. This plan is dynamic. The plan changes while the E3 project is in motion.

Risk Assessment Matrix

To aid in determining where risks to E3 are high, a Risk Assessment Matrix is used to identify the significance of each identified risk. The matrix uses metrics of severity, likelihood, and control.

Severity is measured with a value from 1 to 5. A value of 1 indicates the severity of impact is minor and therefore may minutely impact resources. A severity value of 5 indicates that the impact of the risk will require major resources to mitigate.

Likelihood is the probability that the risk will occur. Risks that have a zero percent probability should not be listed. Knowing the level at which a risk may occur aids in not only designing contingencies, but also allows for planning to mitigate the risk.

Control measures how likely the risk can be mitigated using current resources. A high value in the Control metric should alert the Library that the project needs serious consideration to continue.

The *Alert Level* is a score combining Severity and Likelihood. A high score in this category should indicate a problem that needs to be addressed immediately within the project. A low score in the Alert Level should not be discounted. Since there is a probability for occurrence, the risk is still valid.

The *Action* column describes what activity or contingency plan is necessary to either mitigate the risk or respond to the risk. This column may reference other plans or procedures for further clarification.

Risk Severity

Severity Impact	Weight
Minor	1
Moderate	2
Significant	3
Very significant	4
Disastrous	5

Control

Manageability	Weight
Easily avoidable	1
Very controllable	2
Moderately controllable	3
Difficult to control	4
Uncontrollable	5

Risk Likelihood

Occurrence	Weight
Unlikely	1
Somewhat likely	2
Possible	3
Very possible	4
Almost certain	5

Risk Categories

External
Budget
Time
Operations
Technology

Risk Assessment Matrix

©Liberated Technology Solutions. Used with permission

Risk Category	Risk	[1] Severity of Impact	[2] Likelihood of Occurrence	Alert Level [Sum of 1 + 2]	Level of Control	Action
External	Network outage	3	4	7	5	Notify ASU West IT
Tech	Performance problems	4	3	7	3	Dedicate resources to fix problem
External	Natural or un-natural disasters	5	1	6	5	Alternate location or declare loss
Time	Unexpected events (attrition, sickness, etc.)	4	2	6	5	Adjust project schedule/expectations
External	ASURITE authentication methods negate our current system	4	2	6	4	Work with IT to find alternative system
External	Intrusion	4	2	6	3	Follow intrusion guidelines in operations manual
External	Campus Firewall blocking	3	3	6	3	Notify ASU West IT to open port
Budget	Shortfall of required resources	4	2	6	3	Temporarily reduce services/resource utilization
Time	Overextending time investment on an issue	3	3	6	3	Adjust project schedule

Risk Category	Risk	[1] Severity of Impact	[2] Likelihood of Occurrence	Alert Level [Sum of 1 + 2]	Level of Control	Action
External	DOS attack	3	3	6	2	1. Alert ASU West IT 2. Secure server
External	Sustained power failure	4	1	5	5	Notify ASU West Facilities
External	Government regulatory changes	3	2	5	5	Adjustment
Tech	Product obsolescence	3	2	5	5	Find congruent replacement/assess need for new strategy
External	ASU strategy changes	3	2	5	4	Reassessment
External	Changes in resource/operations funding	3	2	5	4	Assess cost centers for reallocation
Tech	Defects or bugs in hardware or software	3	2	5	4	Rollback system or use alternate
External	Campus strategy changes	3	2	5	3	Reassessment
Budget	Cost of resources exceeds identified limits	3	2	5	3	Reallocate resources
Time	Lack of required resources to meet expectations	3	2	5	3	Assess project/change expectations
Operations	Unresolved conflicts	3	2	5	3	Constructive dialog
Tech	Integration problems	3	2	5	3	Dedicate resources to fix problem
Operations	Implementation overkill	3	2	5	2	Adjust scope to manageable deliverables
Budget	Underestimating costs	4	1	5	1	Reallocate resources
Time	Resource reassignments	4	1	5	1	Adjust project schedule/expectations
Operations	Lack of training or orientation	3	2	5	1	Provide immediate training
Operations	Magnitude and scope too high or too low	3	2	5	1	Adjust scope to manageable deliverables
Tech	Lack of adherence to the Systems Development Lifecycle	4	1	5	1	Review project plan for deficiencies and correct them

Risk Category	Risk	[1] Severity of Impact	[2] Likelihood of Occurrence	Alert Level [Sum of 1 + 2]	Level of Control	Action
Tech	Other server component failure	3	1	4	5	Replace hardware. Downtime will depend on component
Tech	Unplanned lifecycle	3	1	4	5	Use redundant systems and replace old
Operations	Ineffective communication	2	2	4	3	Contact all stakeholders for communication channel changes
External	Library strategy changes	3	1	4	2	Reassessment
Time	Error in time estimations	2	2	4	2	Adjust project schedule
Tech	Use of new and untested technologies	2	2	4	2	Maintain fallback system
Tech	Over/under estimating requirements	3	1	4	2	Acquire resources if within budget
Time	Unrealistic expectations using given resources	3	1	4	1	Focused dialog
Time	Schedule changes	2	2	4	1	Adjust resource allocation and assignment
Operations	Lack of authority and accountability	3	1	4	1	Discuss with Library Dean
Operations	Frequent role and/or assignment changes	3	1	4	1	Add new project members. Remove variable staff
External	Online catalog vendor changes system protocols	2	1	3	5	Work with Hayden LIST
External	Legal issues and disputes	2	1	3	3	n/a
Tech	Server hard drive failure	1	1	2	5	Replace with spare/all use RAID 5

Quality Assurance

The E3 Project Manager will monitor the practices of the Quality Assurance Manager throughout the project lifecycle. The Project Manager will enforce the quality principles and practices utilized. Quality is the responsibility of all involved in the project. The Quality Assurance Manager will measure the quality parameters at various stages on identified tasks. If designated for QA, a quality check must be performed before the next activity initiates.

Throughout the project documentation, a quality assurance icon

is used to indicate where a quality check by the Quality Assurance Manager should be performed.

Parameters of QA

- Accuracy
- Reliability
- Maintainability
- Error-free product
- Traceability
- Efficiency

Indicators of QA

- Completeness
- Design Integrity
- Defect Detection
- Fault Detection
- Documentation

TS&D Quality Assurance Checklist

Public Workstation Assembly

The following list is to be completed by the Quality Assurance Manager

- ❑ All internal cables located away from moving parts
- ❑ Components and cables positioned for optimal input and exhaust airflow
- ❑ Components mounted using adequate number of fasteners
- ❑ Components completely and securely seated in sockets
- ❑ Area clear of debris and free-moving parts
- ❑ Proper grounding precautions adhered to

Inventory Testing

Some items need to be tested upon receipt to ensure return-policies can be exercised. The following items are to be tested within the first 15 days of receipt.

RAM

Memory modules will be tested using the SIMM/DIMM Tester (model 3000) on a grounded surface. Any defective memory will be promptly repackaged and given to the Project Manager.

CPU

CPUs will be tested by running an aggressive posting test via recipient motherboard BIOS. Additionally, visual inspection of each pin on the CPU will be performed with attention to bent pins. Any defective CPU will be promptly repackaged and given to the Project Manager.

Acceptable % of Defects: 7% per lot

Sum-of-the-Years' Depreciation of Equity Model for Parts Replacement

TS&D utilizes the SOTY depreciation model for estimating the needs to replace parts or equipment. This method takes into account the recency of an item and its lifespan before the entire unit is replaced.

```
  [(original cost)-(estimated salvage value)]
x (remaining life in years/sum of the years' digits)
  = dollar cap for funding replacement part
```

Example:

```
    [($500 original cost) -($100 salvage value)]
x (2 remaining years/3 years life expectancy)
   (400) x (2/(1+2+3))
   400 x .50 = $200 cap for replacement parts for year 2
   additional breakdown:
   400 x 1 = $400 cap for replacement parts for year 1
   400 x .33 = $132 cap for replacement parts for year 3
```

Service Measurement Standards
The library has created service standards for TS&D to use as a guideline and benchmark for service delivery. The following standards address services for all PAC (public access stations) and the Library classroom.

Public Access Workstation Standards

- Reference Personnel will promptly report each problem to TS&D. TS&D acknowledges the problem and diagnosis within identified time frame to meet *service priorities* and responds with initial status.

- TS&D will leave public areas in which they are working clean when work is completed.

- Each Atrium and PAC machine/printer will be checked daily for functionality.

- On-call assistance from TS&D available for emergency situations while the library is open.

- The Chair of Reference Council will be consulted about scheduling and priorities for upgrades and changes as they are being planned by TS&D. The Reference Council Chair will communicate with Reference Desk Personnel as appropriate.

- There will be consistent training made available to all staff when any new technology changes are implemented.

TS&D Service Priorities

Service Disruption	Maximum TS&D Response Time	% Maximum Inoperable
Networked Stations	24 hours	25%
Stand-Alone Stations	24 hours	n/a
Local Network	2 hours	n/a
Printers - Networked Stations	4 hours for quick fix 48 hours for full-service fix	25%

TS&D will respond to these items within the times given. Repairs and/or replacement times may vary due to out-of-stock parts, orders, shipping times, etc.

Classroom Workstation Standards

- Problems are reported promptly and systematically to TS&D. TS&D acknowledges the problem and responds with an initial status within 24 hrs.
- TS&D will diagnose the problem and report the anticipated time for a fix within a reasonable time.
- There will be a readily accessible mechanism for tracking the follow-up status of work, including who is responsible for the task and timelines for resolution.
- Each classroom computer and the instructor station will be checked weekly for functionality by TS&D and/or library staff.
- On-Call assistance available for emergency situations defined as percentage of inoperable stations being exceeded while the library is open.
- A current troubleshooter checklist will be available for classroom users at all times for quick fixes and questions.
- Academic Program Support will be consulted about scheduling priorities for upgrades, maintenance, and changes as they are being planned by TS&D.
- There will be consistent training made available in advance of the need to use/demonstrate new technologies and uses in the classroom.
- Replication of the access to public workstation resources in the classroom will be done based on (1) instructional need and (2) budget capability determined by Academic Program Support.
- Instructional devices- AV projector, etc. will be compatible with existing or anticipated systems. Implications of the lack of compatibility will be communicated prior to purchase or installation.

TS&D Service Priorities

Service Disruption	Maximum TS&D Response Time	% Maximum Inoperable
Student station	1 week	20%
Instructor Station	24 hours	n/a
Projection System	24 hours	n/a

Training

Implementing a new architecture and operating system requires a fair amount of education for support staff. Technical staff need the tools and knowledge to enable themselves in not only maintaining the new model, but also provide the capability to innovate within the new model. Library support staff require the skills to effectively utilize the applications provided and promote the use of these applications to their constituents.

Technical Support Staff

Technical staff must have a foundation understanding of the Linux operating system. Obtaining this foundation requires individual effort to accept change. This change involves an emersion into the design, development, and use of Linux systems while systematically removing oneself from using traditional tools- Microsoft OS, Microsoft Office, etc. Since it is good practice to apply the optimal tool for a particular task, some applications or systems may require the continued use of Microsoft Windows-based applications and services. It should not be conveyed that the use of the Linux OS and applications means that all activity must be performed using a Linux OS system. It should be understood that as products emerge and mature, an evaluation of applicability of these products for existence within a Linux environment will provide for an optimal work environment. Until this point arises, extra effort at maintaining skills and knowledge in both Microsoft OS and Linux should be a staff requirement.

- Education Materials
  Technical staff will be provided with the education and training necessary to perform their job. It is a requirement that both staff and supervisor partake in the identification of relevant training and maintenance support available.
- Applications
  Applications that complement or enhance staff activities are to be identified and reviewed by both staff and supervisor for implementation into the work environment.
- Hardware
  Intimate knowledge of the system hardware and their relationships to other components is a core element for timely support and maintenance of the computing environment. Staff have multiple training opportunities available- custom DVD videos, print materials, and peer training and mentoring.
- User Training
  All technical support staff should be able to train others in the feasibility and use of applications and services

Library Support Staff

Each Library unit and individual staff person engages with the computing systems. Unlike technical staff, the breadth of knowledge in these systems is not required. Activities that touch the systems require training in the particular aspects of the systems

within each unique work environment. Training and support are provided by Library technical staff. It is up to the individual and supervisor to identify deficiencies that can be addressed through training. A knowledgeable staff can help maintain an optimal implementation and use of the various systems.

- Education Materials
  Library staff will be provided with the education and training necessary to perform their job. Staff should work with their supervisor to identify needs. The supervisor should work with technical staff in the delivery of training addressing these needs.
- Applications
  Applications that complement or enhance staff activities are to be identified and reviewed by both staff , supervisor, and technical staff for implementation into the work environment.

Training and support materials are also available for viewing and download from the TS&D support website and office.

Knowledge Matrix

User	Library End User Applications	Library Staff Specialized Applications	Support Hardware	Support Systems Applications	Linux Operating System	Technology Trends
Library Patron	Proficient	-	-	-	-	-
Reference Desk	Expert	Awareness of	-	Awareness of	Awareness of	Awareness of
Circulation Desk	Proficient	Expert	-	Awareness of	Awareness of	Awareness of
Administration	Awareness of	-	-	-	Awareness of	Awareness of
Librarians	Expert	Proficient	-	Awareness of	Awareness of	Proficient
Technology Support	Proficient	Proficient	Expert	Expert	Expert	Expert

Implementation

A successful implementation involves a multitude of activities. These activities are categorized and itemized within the master project plan. To enable the best possible results for implementing the various components of the project, the use of verbal, written, and visual instructions in a way that complements an implementer's individual learning style is used.

Senior technical staff are provided with detailed instructions resulting from various planning meetings. These instructions are highly technical and are used as final production documentation for operations. Hardware implementation is primarily performed by student technical support staff. The instructions are in cookbook format. Custom DVD videos provide step-by-step instructions on how to assemble the hardware used. Written instruction with diagrams and pictures further instruct the proper assembly of workstations.

The following pages detail the implementation instructions.

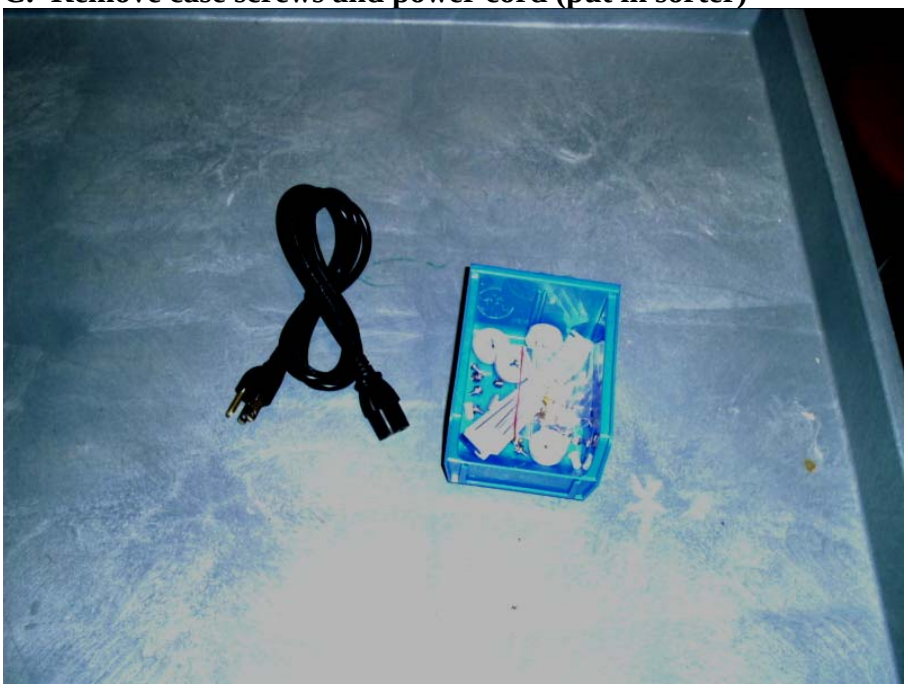
Component Checklist - Circulation Workstations

TYPE	ITEM	QTY	COLOR	CODE	ROOM	SHELF
Motherboard	ECS K7SEM-266	3				
Case	Hon Hai 7C443-115 ATX Case, With P4 Power Supply, Black Color	3			telcom 217w	floor
CPU	AMD Athlon XP 1900PR, 1.6GHz	3			117	12 box
CPU Fan	Thermaltake Volcano 7 A1124 (PIII+AMD)	3			117	12 box
RAM	512mb PC133	3			117	12 box
ZIP	Zip 250	3			117	12 box
Hard Drive	Western Digital 20gb ATA100 7200rpm	3			117	12 box
LAN	Intel Pro/100 S Desktop Adapter w/3DES 168-Bit Encryption	3			117	12 box
CDROM Drive	MITSUMI 48X CDROM Drive [IDE] [BLACK BEZEL]	3			117	12 box
Mouse	Logitech Optical Mouse	3			117	12 box
Keyboard	Belkin Classic Keyboard (black)	3			117	12
Floppy Drive	Teac FD235HFA29 1.44MB	3			117	12 box
Display	PLANAR CT1744Z 17.4IN LCD 1280X1024@75HZ SXGA BLK	3			circ counter	

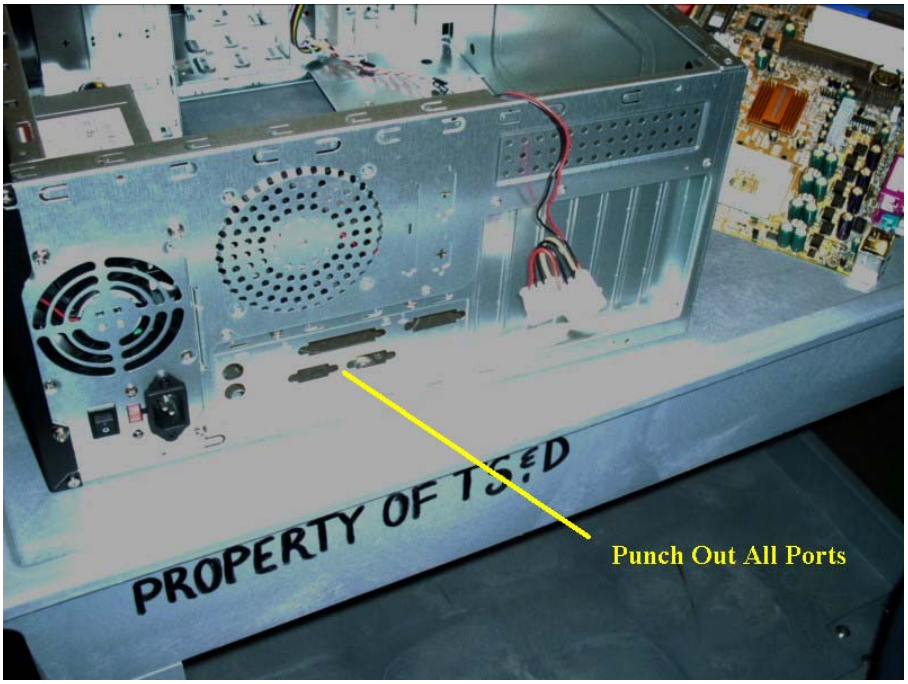
Circulation Workstation Assembly Instructions

STEP 1

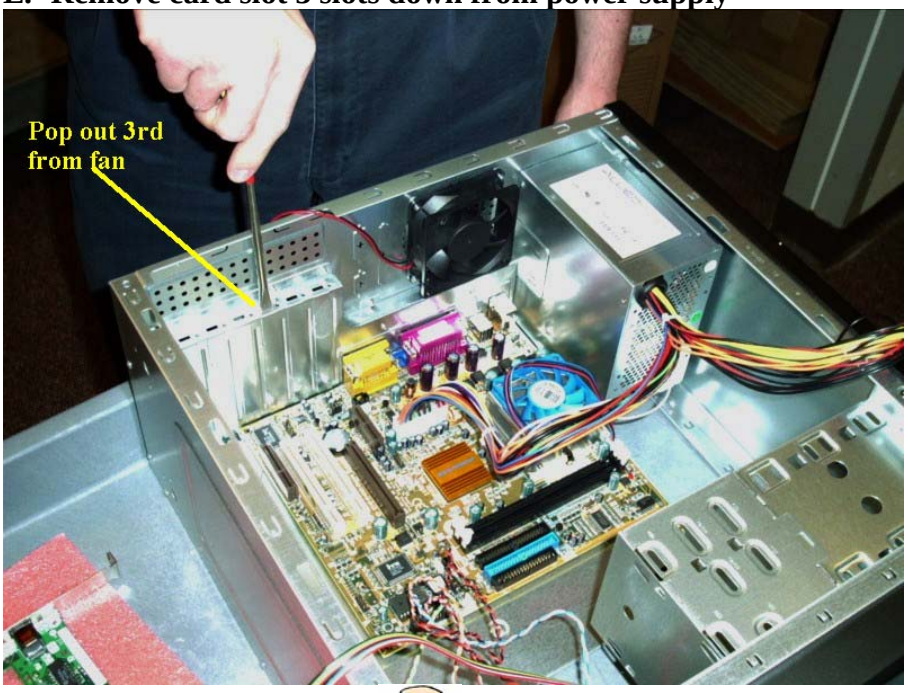
A. **Remove case from packaging**
B. **Open case**
C. **Remove case screws and power cord (put in sorter)**



D. **Punch out PS/2 ports using a screwdriver and pliers to break away pieces**



E. Remove card slot 3 slots down from power supply

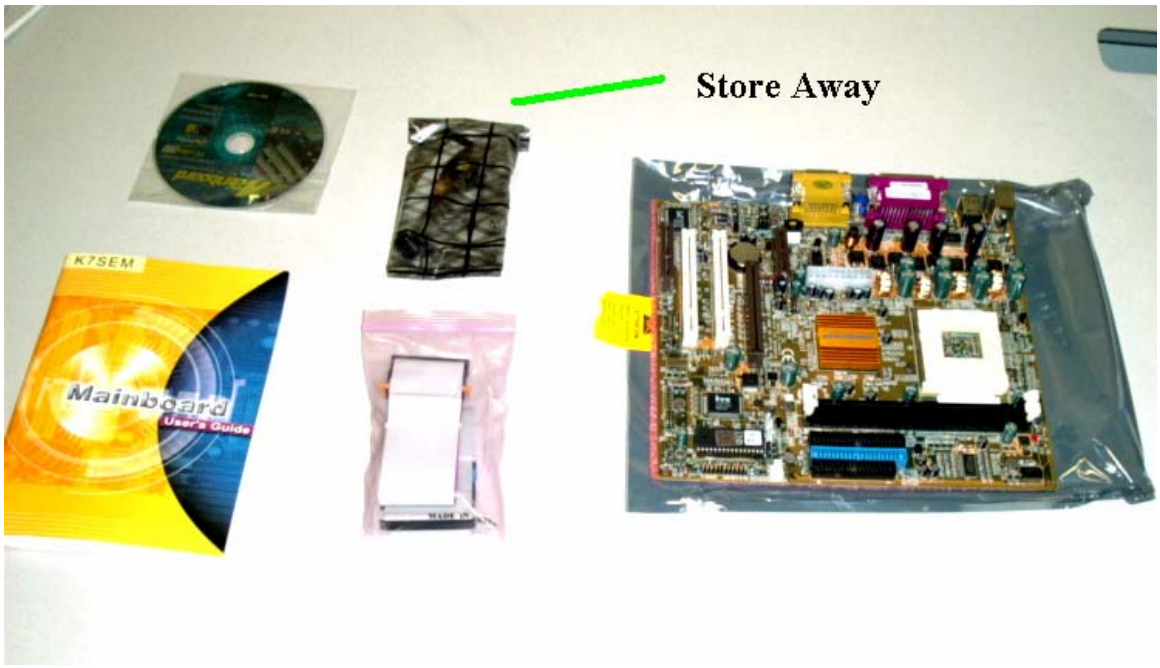


F. Put case cover back on
G. Store in closet

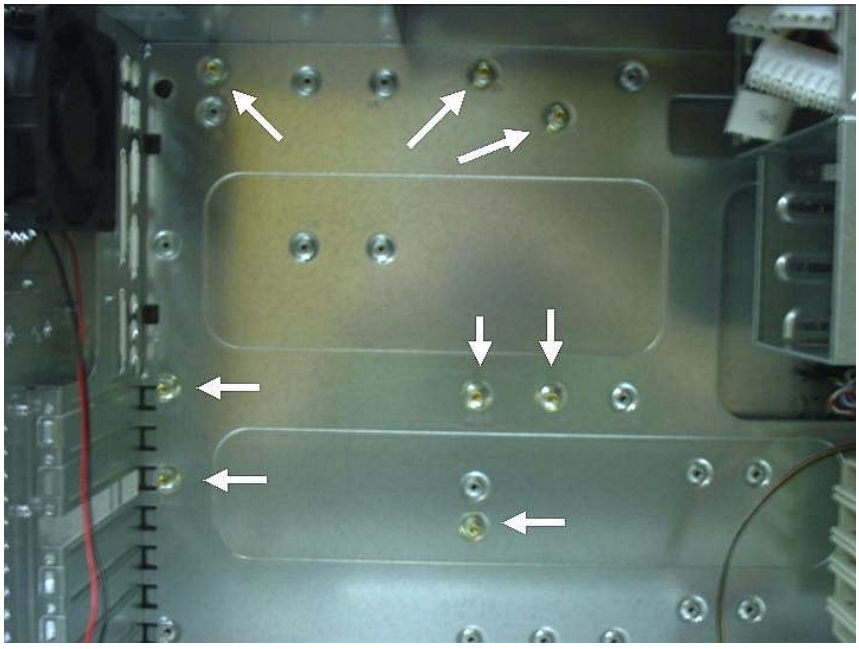
STEP 2

A. Prepare sorter
B. Remove contents from motherboard box

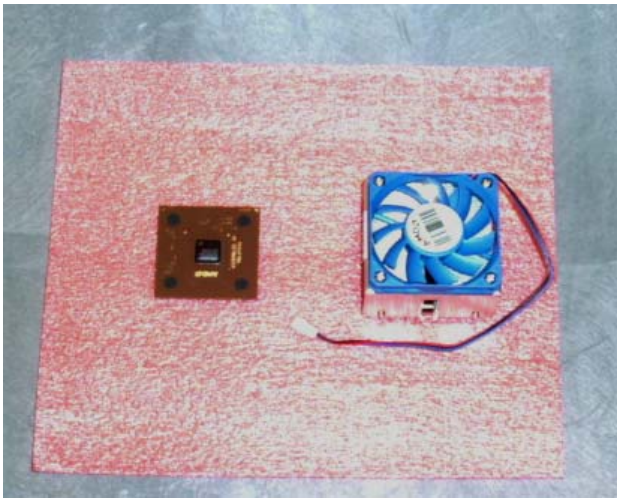
C. Store away LAN connector



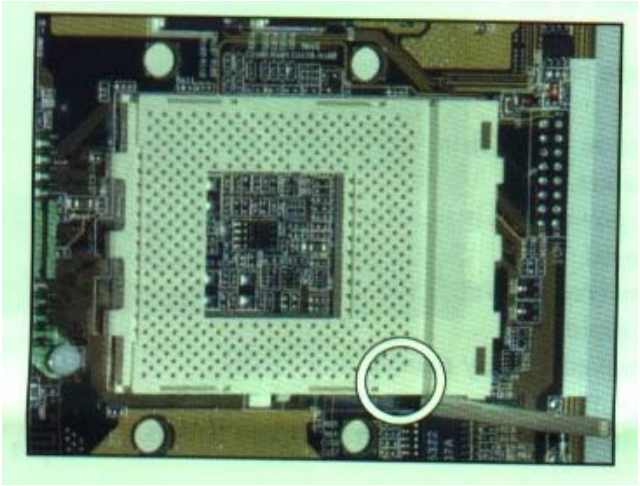
D. Screw in motherboard mounting risers



E. Place CPU and CPU Fan on anti-static mat

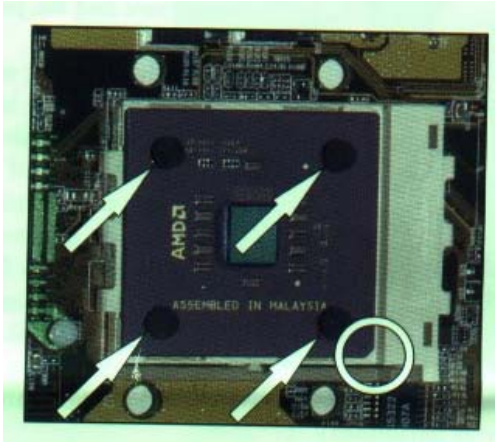


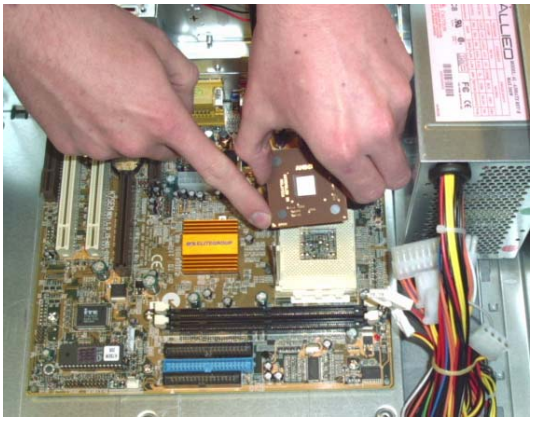
F. Identify CPU notch placement on Motherboard CPU socket (cut corner)

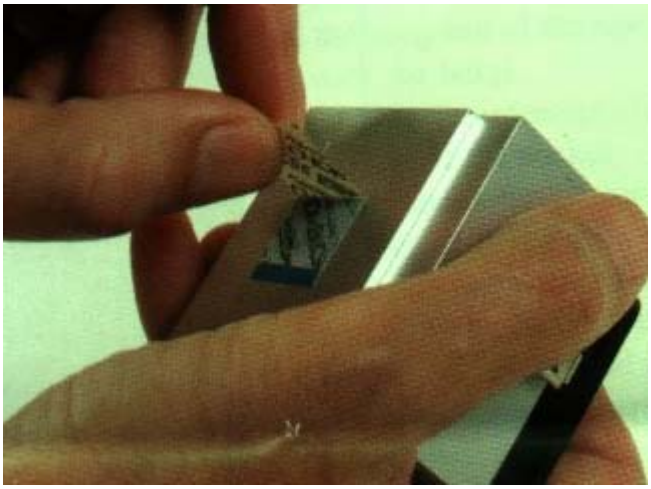


G. Raise CPU socket arm

H. Identify CPU notch location on CPU (cut corner) and place CPU in socket

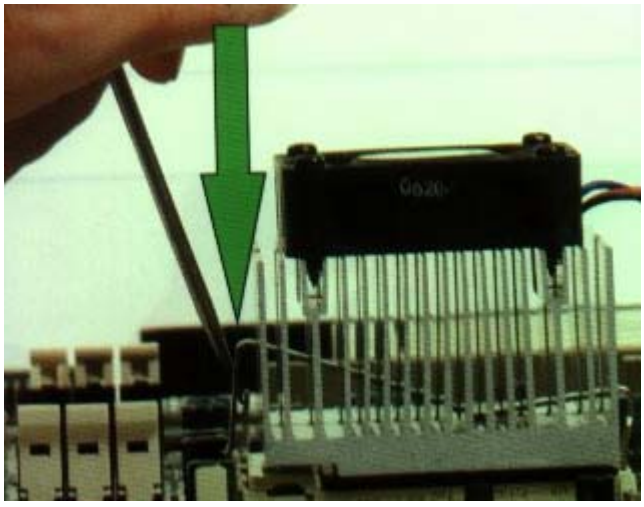


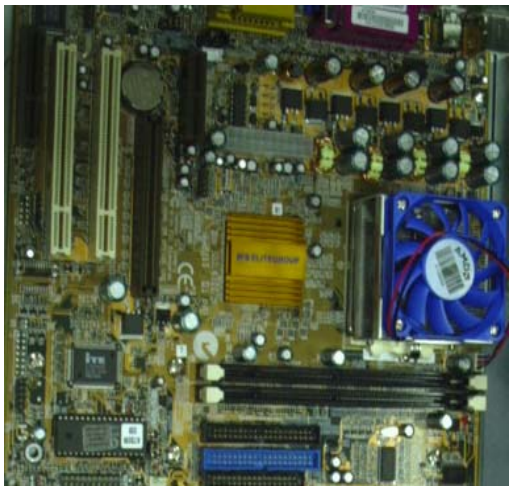




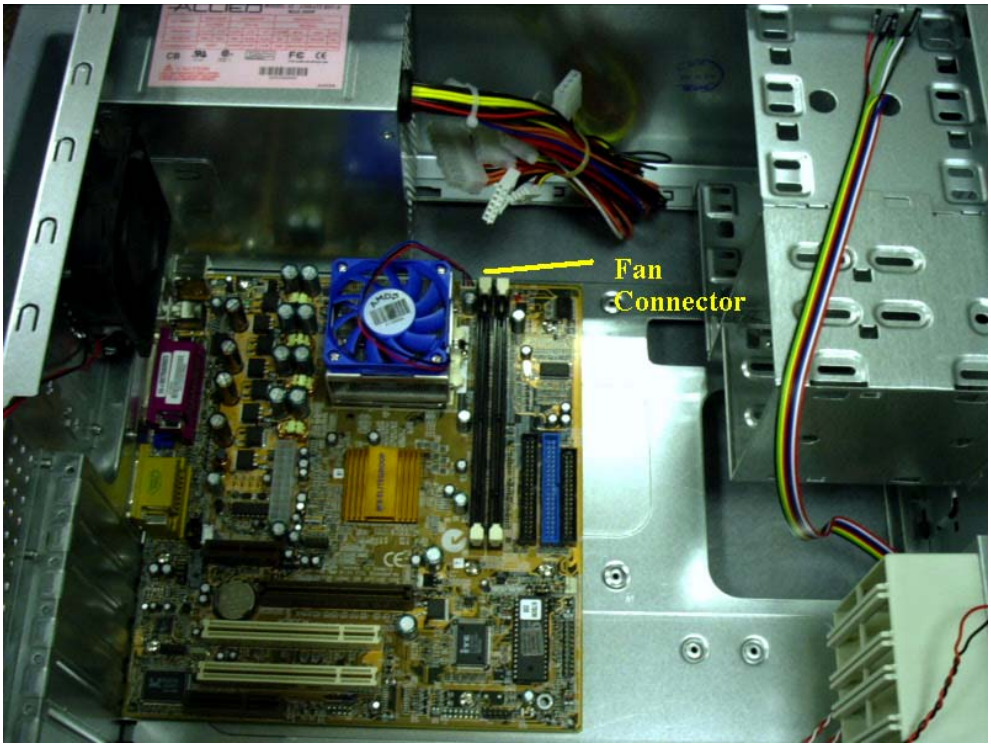
I. **Lower arm back into socket snap**
J. **Peel off sticker thing on heatsink**

K. **Attach CPU heatsink to CPU (Use large flathead screwdriver to press down and hook into place the heatsink clamp)**





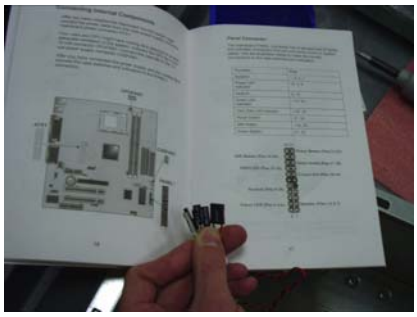
L. Connect CPU fan to motherboard



M. Mount motherboard to case

STEP 3

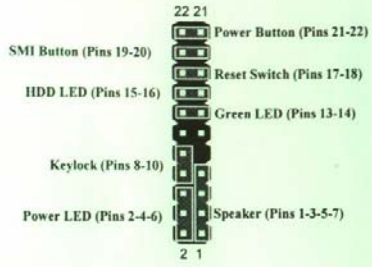
A. Find case cable connector diagram in motherboard manual (good luck)



Panel 1: Panel connectors for switches and indicators

Use the panel connector to implement the switches and indicators on your system case.

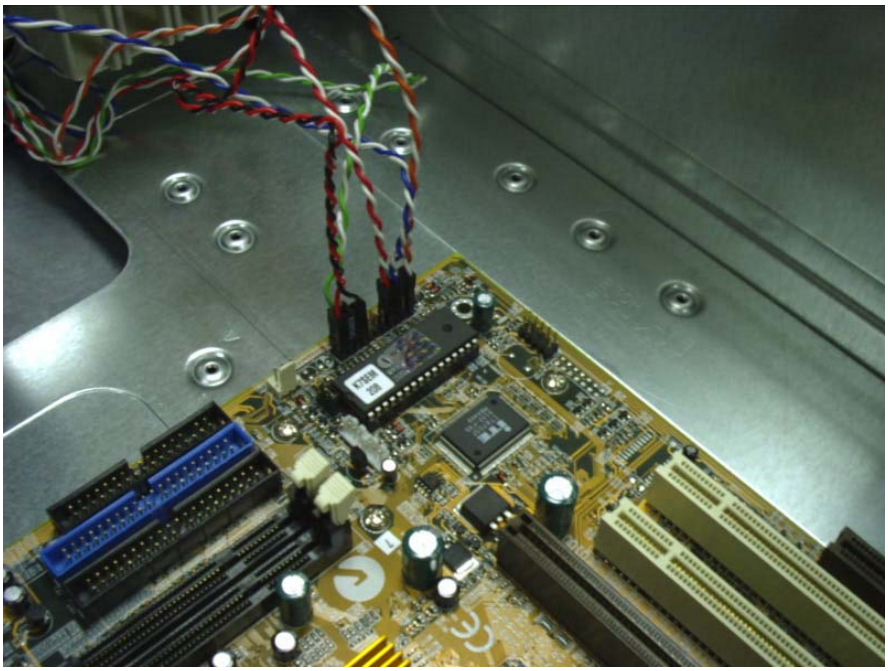
Function	Pins
Speaker	1, 3, 5, 7
Power LED	+2, 4, 6
Keylock	8, 10
Green LED	+13, 14
Hard Disk LED	+15, 16
Reset Switch	17, 18
System Management Interrupt (SMI) Button	+19, 20
Power Button	21, 22



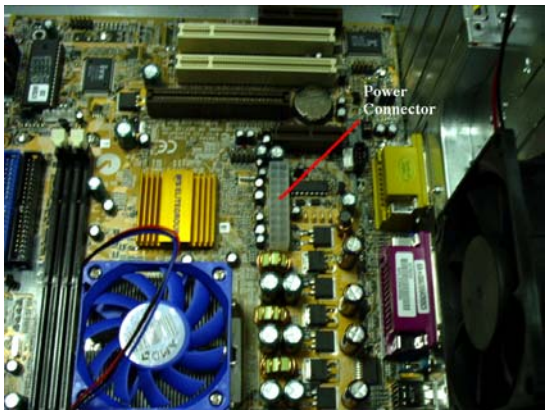
***Note:** The plus sign (+) indicates a pin which must be connected to a positive voltage.*

Speaker ground (black) goes to pin 1
Do <u>not</u> use pin 4 for Power LED

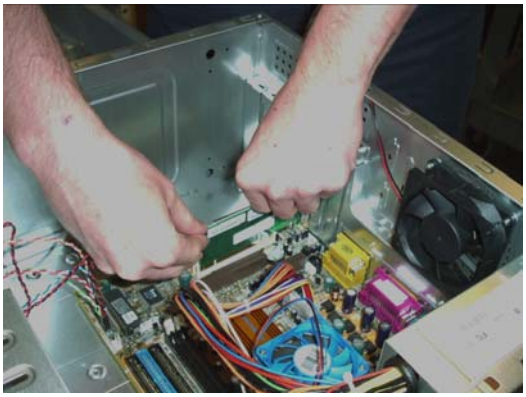
B. Connect case cables to motherboard following instructions from manual



C. Plug in power cable and case fan



D. Get network card and place in first PCI slot from power supply

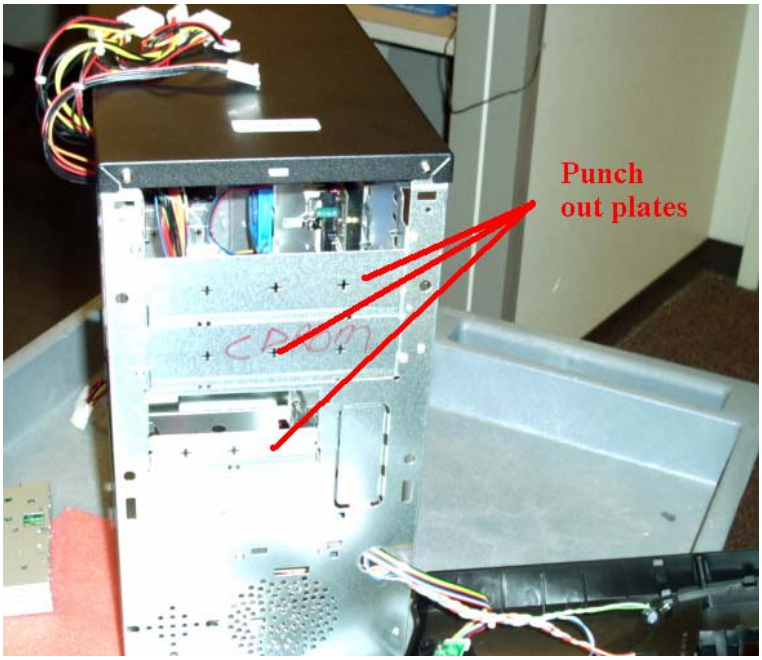


STEP 4

A. Gently press on the bottom tabs to release the case faceplate

B. Repeat on sides and top (total of 6)

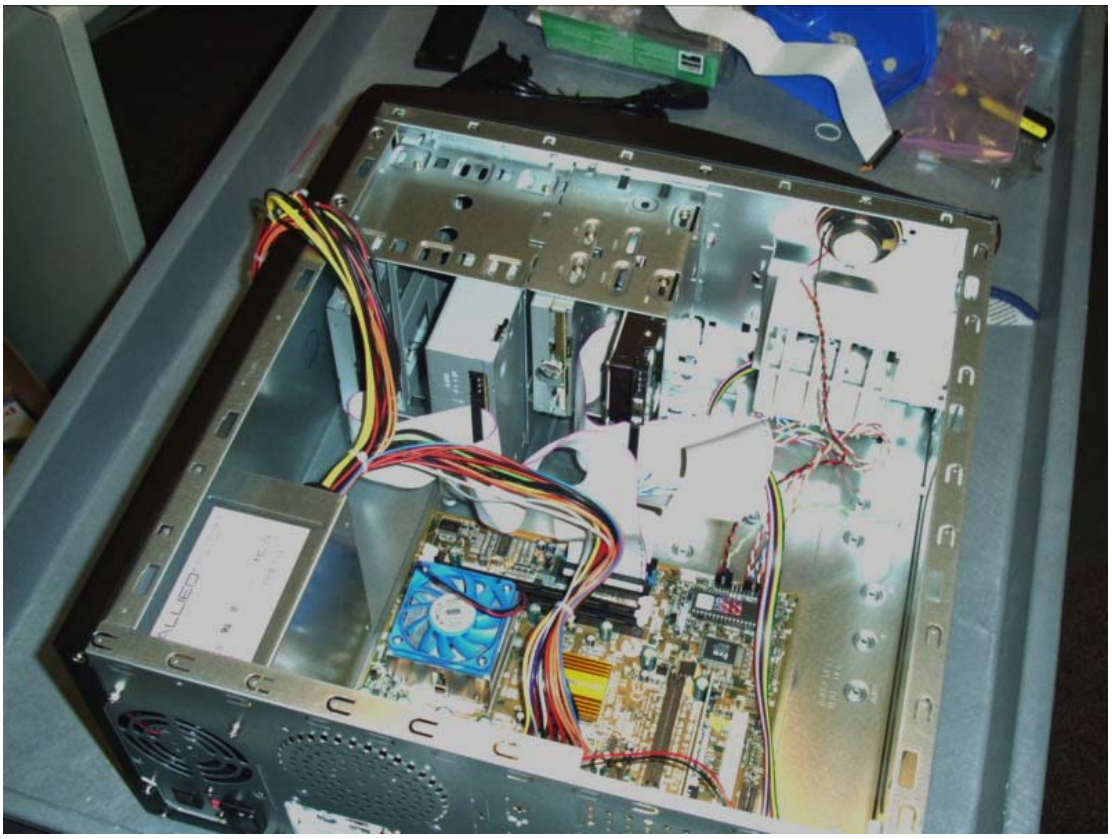
C. Punch out drive plates



D. Gather drives for mounting (zip, floppy, CDROM, hard drive)

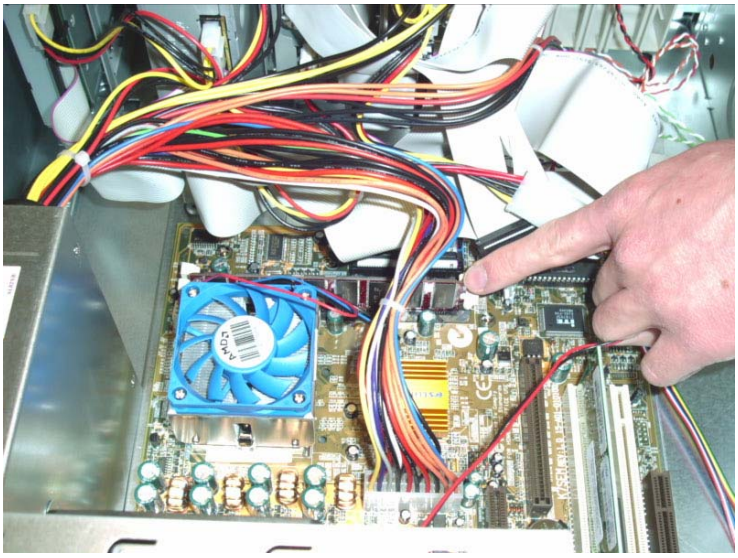
E. Mount floppy, zip, CDROM, and HD drives in drive bays

F. Attach drive cables and power to drives and motherboard (red ribbon on cable is pin 1 and is closest to the power connector)

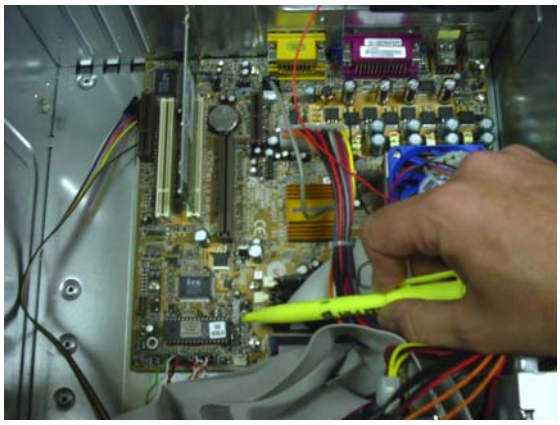


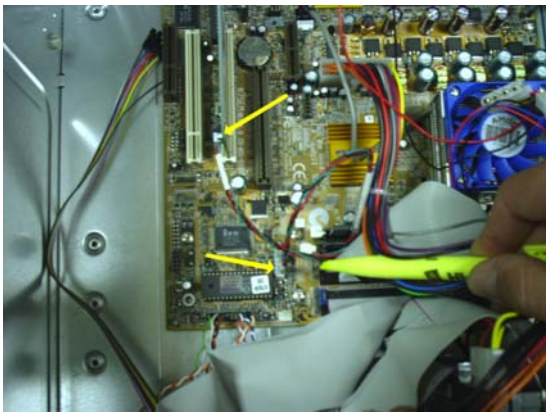
STEP 5

A. Insert RAM into slot closest to CPU



B. Install Wake-On-LAN cables





C. Finish by putting case cover back on

D. Put Asset Tags inside bottom of case
E. Put white on clear machine name label on top of case

STEP 6

A. Connect keyboard, mouse, power cable, and monitor
B. Turn power on
C. Verify power light is on
D. Enter BIOS

*** Note: The use of the word “Default” means leave setting as is.

A. Standard CMOS

1. Set Date and Time
2. Set all IDE Devices to Auto Detect
3. Drive A: 1.44
   Drive B: NONE
   Floppy 3 Support: Disabled

B. Advanced BIOS Features

1. Antivirus: Disabled
2. CPU Internal Cache: Enabled
3. External Cache: Enabled
4. Processor Number Feature: Enabled
5. Quick Power On Self Test: Enabled
6. First Boot Device: HDD-0
   Second and Third Device: Disabled
   Boot Other: Enabled(needed for wakeonlan)
7. Swap Floppy: Disabled
8. Boot up Floppy Seek: Enabled
9. Leave the rest as Default

C. Advanced Chipset Features

1. ADV DRAM Control: Auto (leave 2nd entry alone)
2. System and Video Cacheable: Enabled
3. Memory Hole: Disabled
4. Memory Parity Check: Enabled

D. Integrated Peripherals

1. SIS 730 OnChip IDE:
   a. Internal PCI/IDE: Both
   b. IDE Burst Mode: Enabled
   c. Everything Else: Auto
2. SIS 730 OnChip PCI: All Enabled
3. SIS 950 Super IO Device:
   a. Onboard FDC: Enabled
   b. Onboard Serial Port: 3F8/IRQ
   c. UART 2 Mode Controller: Disabled
   d. Onboard Parallel: 378/IRQ
   e. Parallel Port Mode: ECP+EPP
   f. ECP Mode Use DMA: 3
   g. Leave the rest as Default
4. H/W Reset Function: Enabled
5. USB Controller: Enabled
6. Onboard PCI LAN: Disabled
7. Leave the rest as Default

E. Power Management

1. ACPI Function: Enabled
2. Video Off Option: Always On
3. HDD Off After: Disabled
4. PM Wakeup Events:
   a. IRQ [3-7, 9-15]: Enabled
   b. PC/PME Power Up Control: Enabled
   c. Leave the rest as Default

F. PnP/PCI Configurations

1. Reset Configuration Data: Enabled
2. Leave the rest as Default

G. PC Health Status

1. Shutdown Temp.: 65˚C / 149˚F

H. Voltage Frequency

1. Set Voltage CPU / DRAM: 133/133/33

I. Set Password

1. wXXXXXXe (lowercase)

J. *Save + Exit Setup*

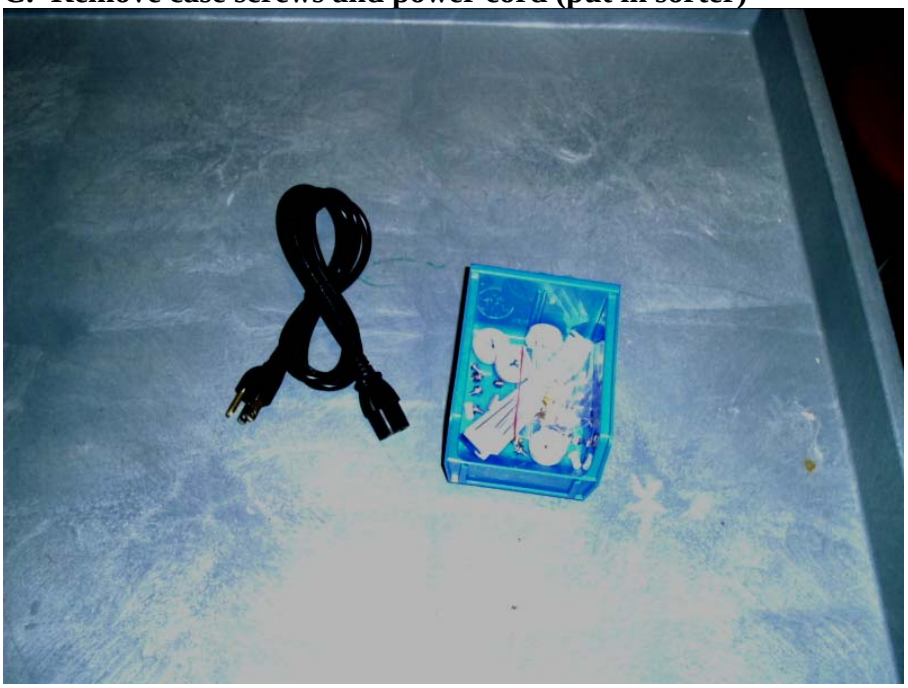
Component Checklist - Classroom Workstations

TYPE	ITEM	QTY	COLOR	CODE	ROOM	SHELF
Case	Hon Hai 7C443-115 ATX Case, With P4 Power Supply, Black Color	30	GREEN	1	telcom 217w	floor
CPU	AMD Duron 1ghz OEM	30	GREEN	2	116	6
CPU Fan	Coolermaster Universal Fan	30	GREEN	3	117	6
Floppy Drive	Teac FD235HFA29 1.44MB	30	GREEN	4	117	6
Hard Drive	Western Digital 20gb ATA100 7200rpm	30	GREEN	5	117	6
Keyboard	Belkin Classic Keyboard (black)	30	GREEN	6	117	8
LAN	Intel Pro/100 S Desktop Adapter w/3DES 168-Bit Encryption	30	GREEN	7	117	8
Monitor	Planar FWT1503Z	30	GREEN	8	Telcom 206E	
Motherbd	ECS K7SEM-266	30	GREEN	9	117	7
Mouse	Logitech Optical Mouse	30	GREEN	10	117	8
RAM	512mb PC133	30	GREEN	11	117	6
Security Lock	Hex Nut	30	GREEN	12	117	6
ZIP	Zip 250 & mounts	30	GREEN	13	117	7

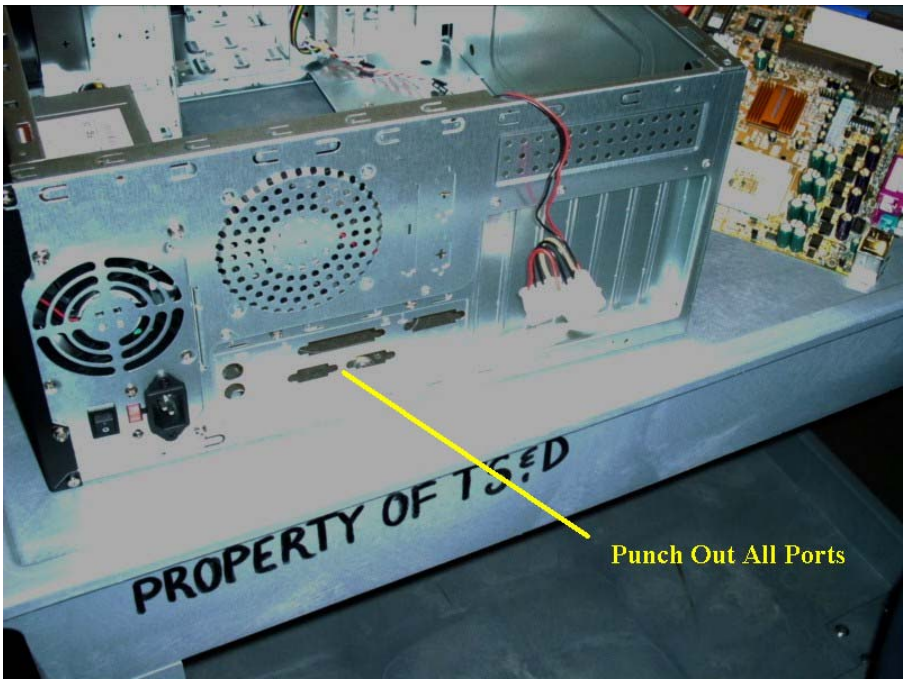
Classroom Workstation Assembly Instructions

STEP 1

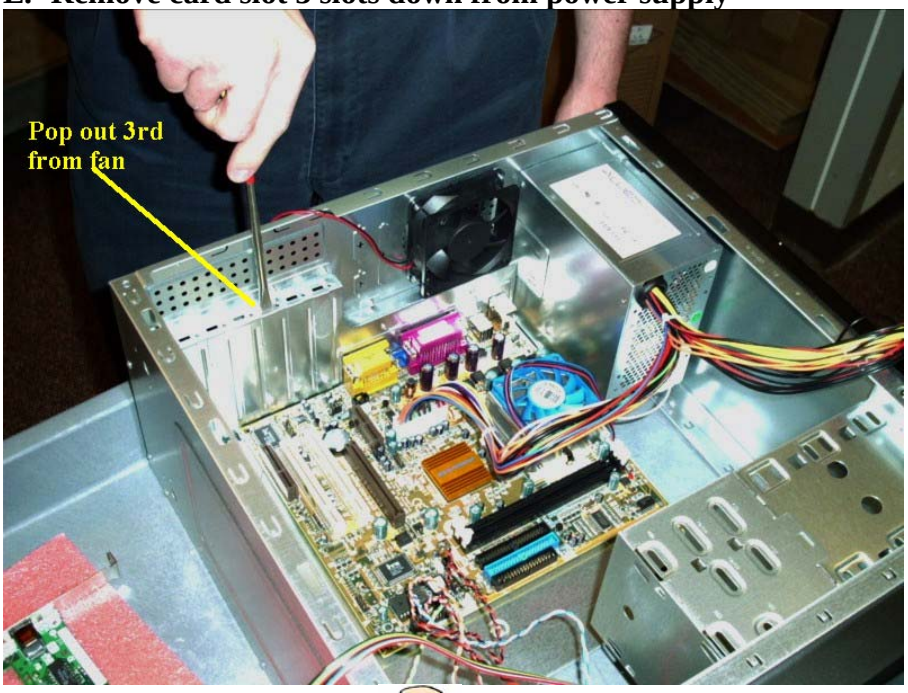
A. **Remove case from packaging**
B. **Open case**
C. **Remove case screws and power cord (put in sorter)**



D. **Punch out PS/2 ports using a screwdriver and pliers to break away pieces**



E. Remove card slot 3 slots down from power supply

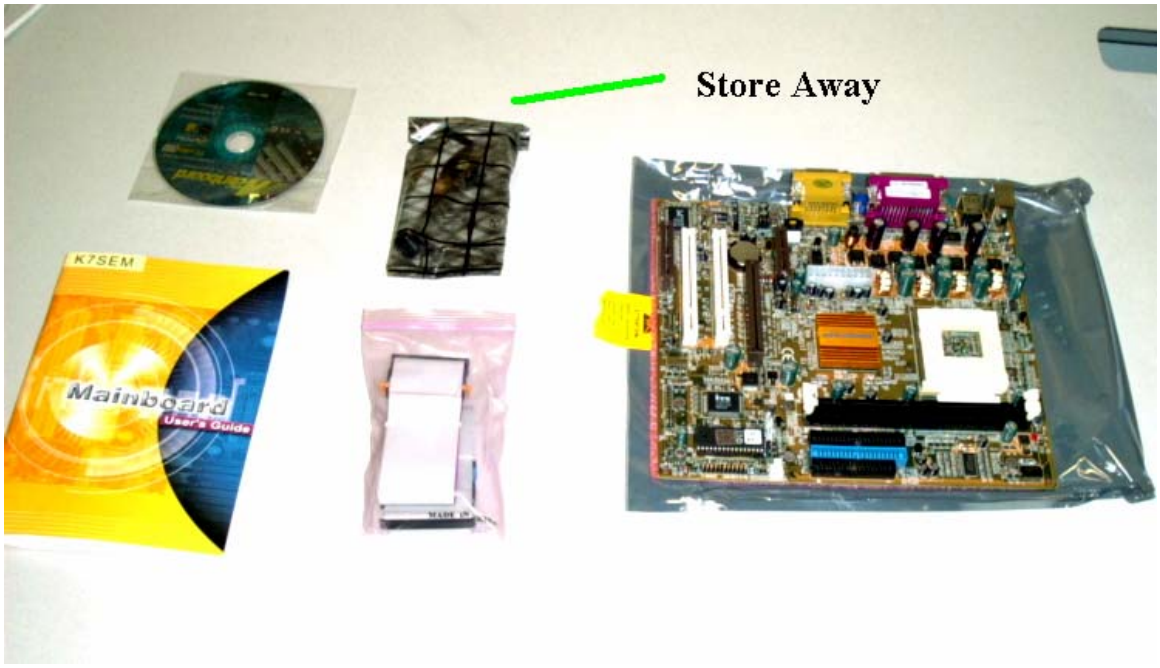


F. Put case cover back on
G. Store in closet

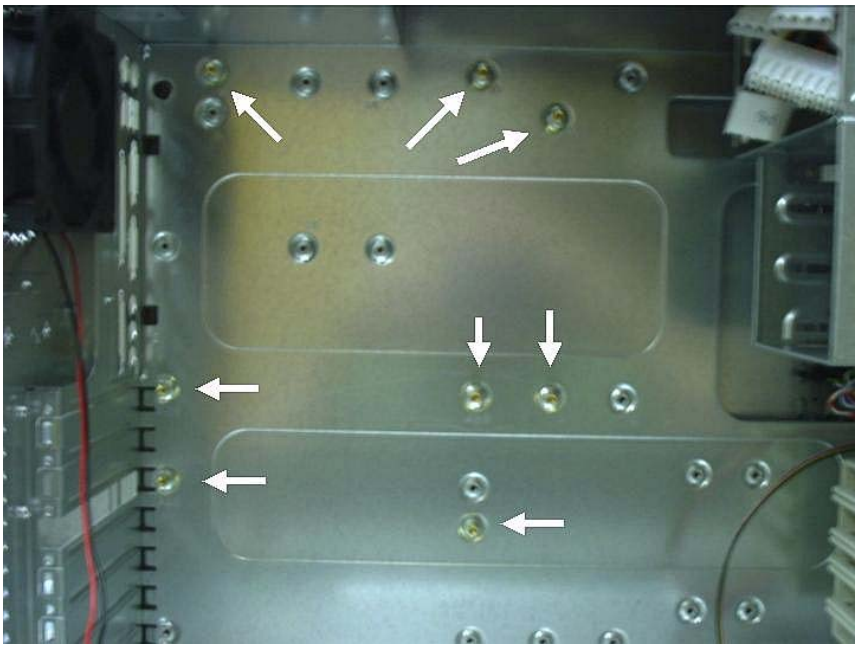
STEP 2

A. Prepare sorter
B. Remove contents from motherboard box

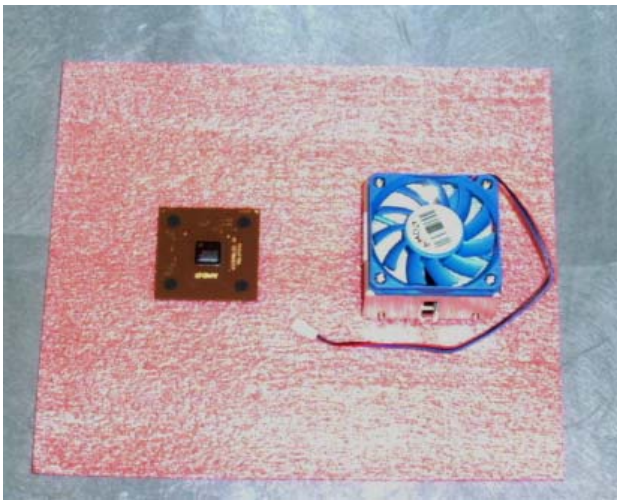
C. Store away LAN connector



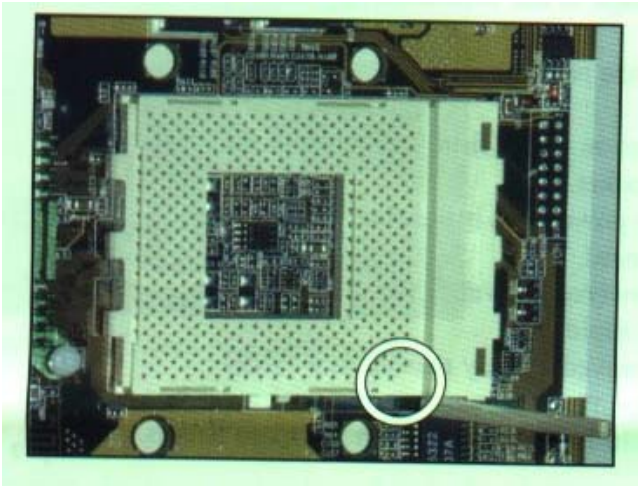
D. Screw in motherboard mounting risers



E. Place CPU and CPU Fan on anti-static mat

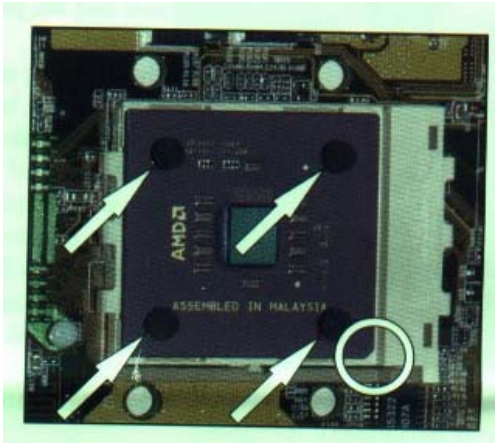


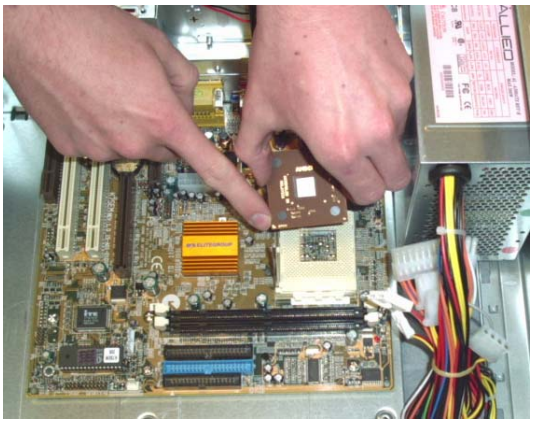
F. Identify CPU notch placement on Motherboard CPU socket (cut corner)



G. Raise CPU socket arm

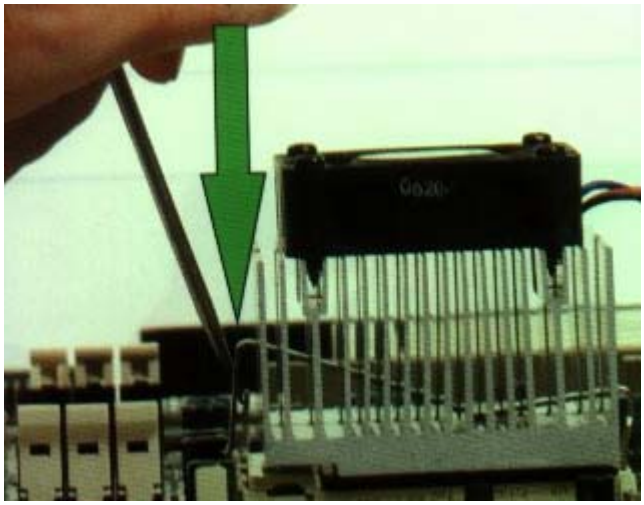
H. Identify CPU notch location on CPU (cut corner) and place CPU in socket

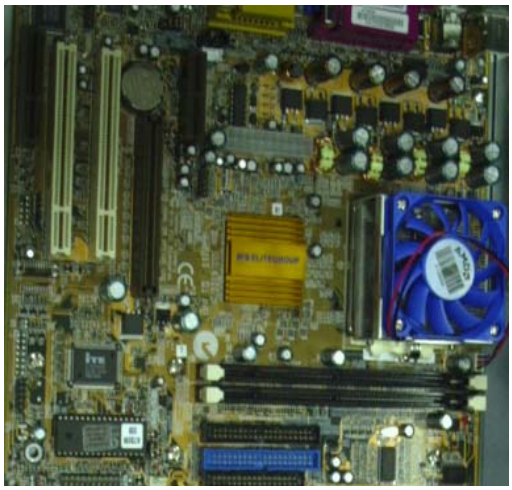




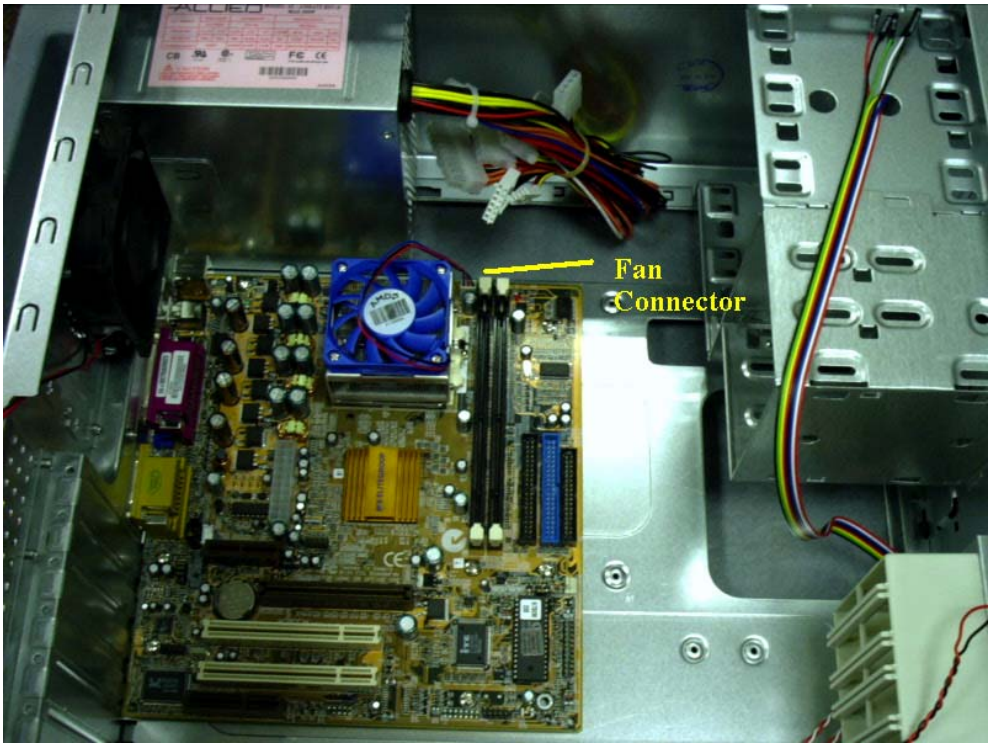
I. **Lower arm back into socket snap**
J. **…**

K. **Attach CPU heatsink to CPU (Use large flathead screwdriver to press down and hook into place the heatsink clamp)**





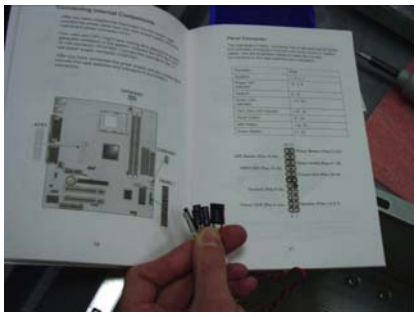
L. Connect CPU fan to motherboard



M. Mount motherboard to case

STEP 3

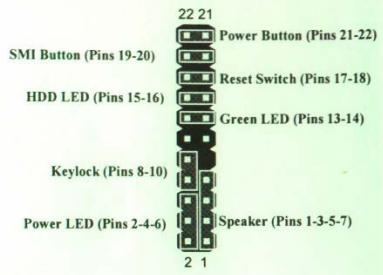
A. Find case cable connector diagram in motherboard manual (good luck)



Panel 1: Panel connectors for switches and indicators

Use the panel connector to implement the switches and indicators on your system case.

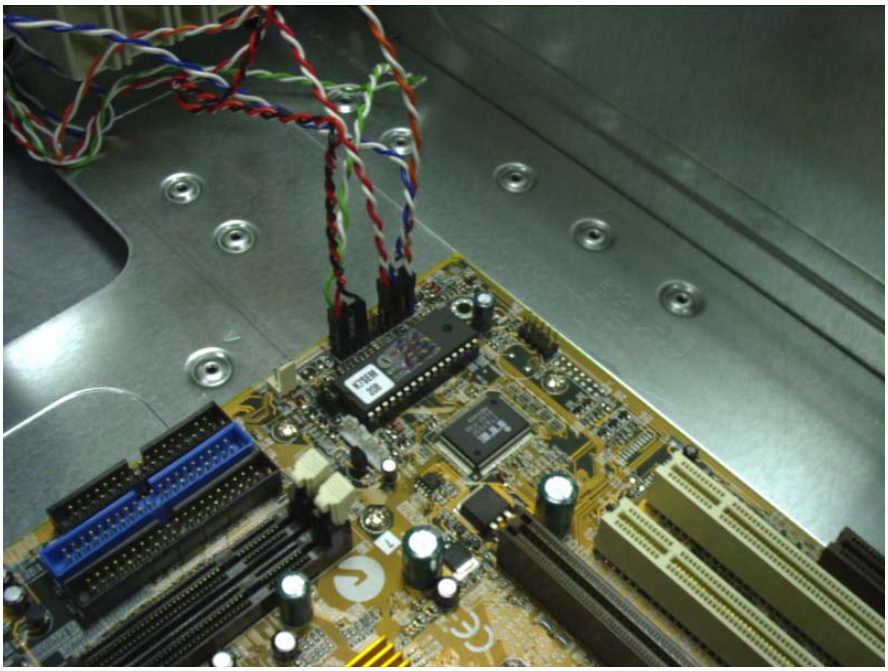
Function	Pins
Speaker	1, 3, 5, 7
Power LED	+2, 4, 6
Keylock	8, 10
Green LED	+13, 14
Hard Disk LED	+15, 16
Reset Switch	17, 18
System Management Interrupt (SMI) Button	+19, 20
Power Button	21, 22



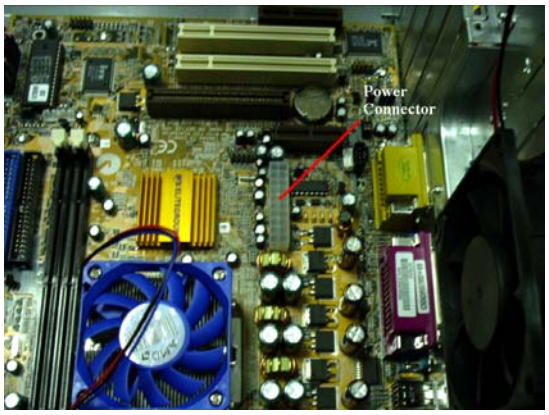
***Note:** The plus sign (+) indicates a pin which must be connected to a positive voltage.*

Speaker ground (black) goes to pin 1
Do <u>not</u> use pin 4 for Power LED

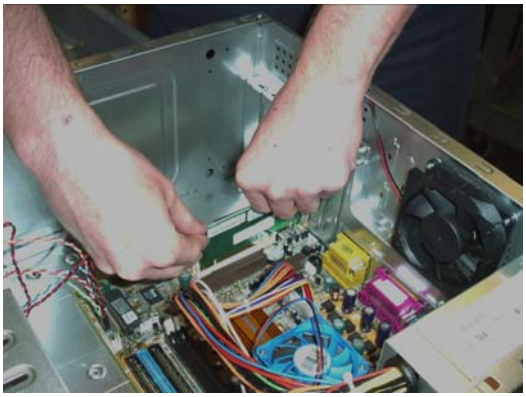
B. Connect case cables to motherboard following instructions from manual



C. Plug in power cable and case fan



D. Get network card and place in first PCI slot from power supply

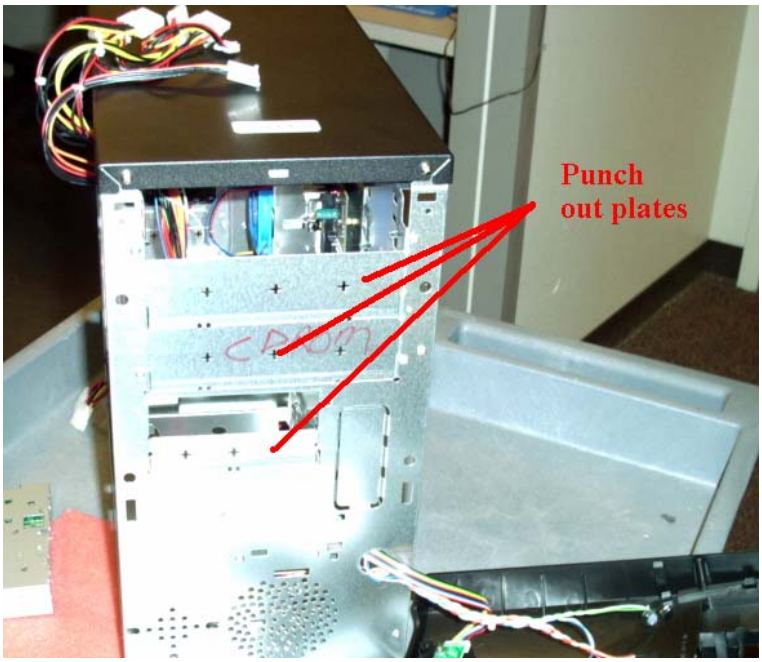


STEP 4

A. Gently press on the bottom tabs to release the case faceplate

B. Repeat on sides and top (total of 6)

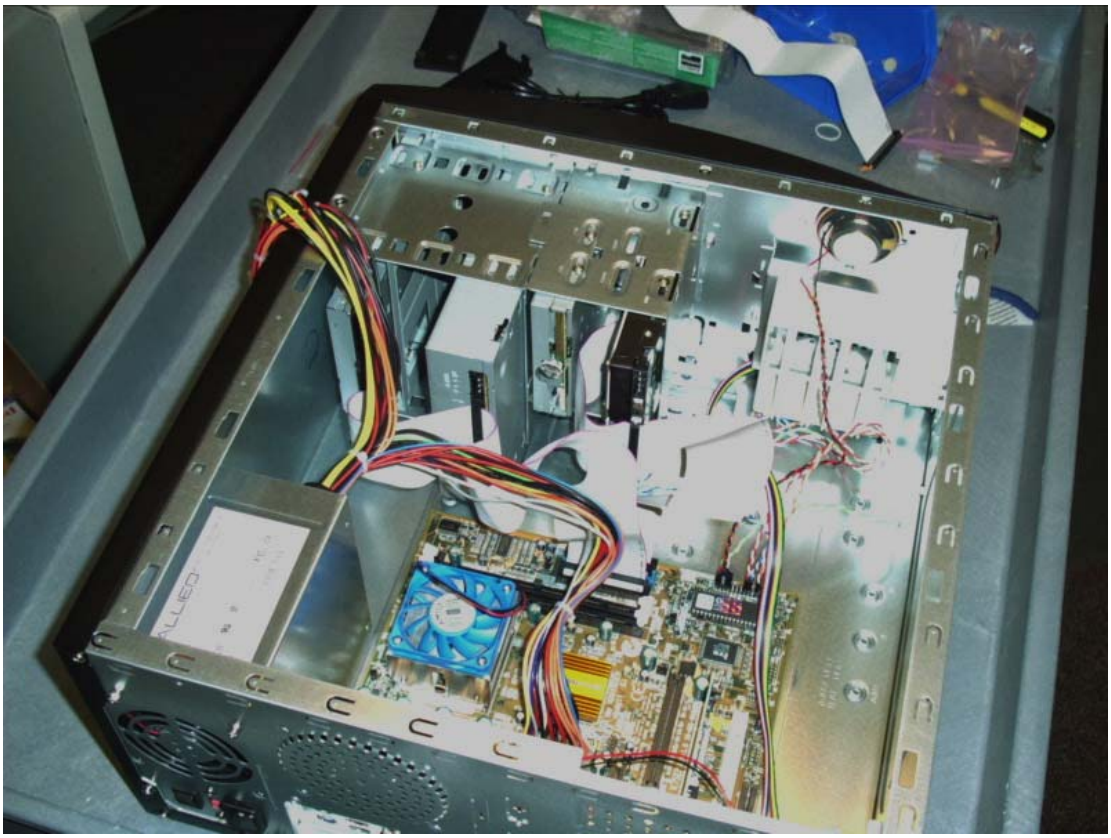
C. Punch out drive plates



D. **Gather drives for mounting (zip, floppy, 20gb hard drive)**

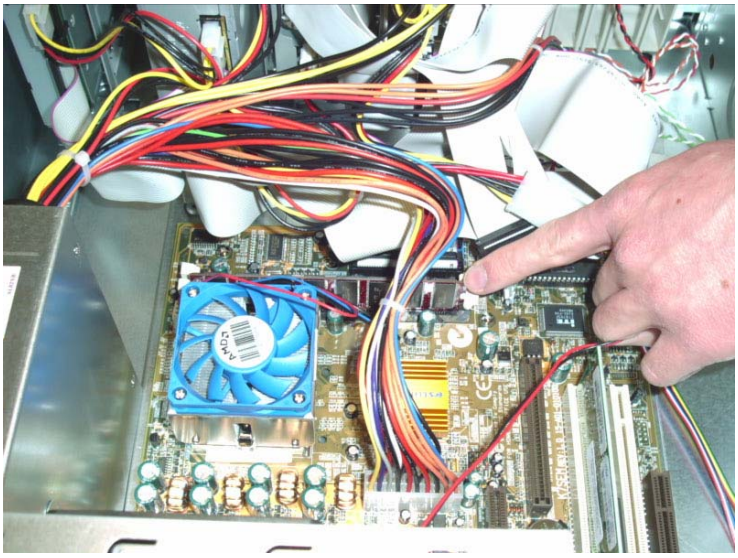
E. Mount floppy, zip, and HD drives in drive bays

F. Attach drive cables and power to drives and motherboard (red ribbon on cable is pin 1 and closest to power connector)

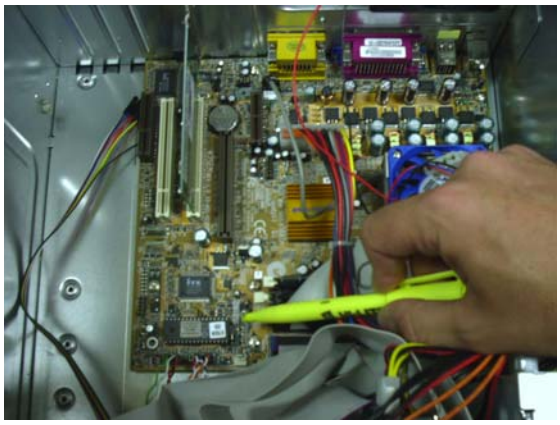


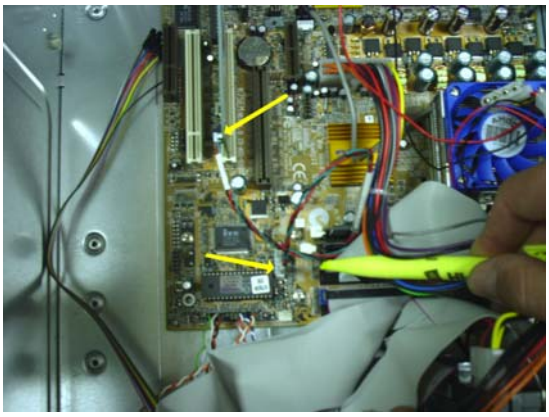
STEP 5

A. Insert RAM into slot closest to CPU



B. Install Wake-On-LAN cables





C. Finish by putting case cover back on

D. Put Asset Tags inside bottom of case
E. Put white on clear machine name label on top of case

STEP 6

A. Connect keyboard, mouse, power cable, and monitor
B. Turn power on
C. Verify power light is on
D. Enter BIOS

*** Note: The use of the word “Default” means leave setting as is.

A. Standard CMOS

1. Set Date and Time
2. Set all IDE Devices to Auto Detect
3. Drive A: 1.44
4. Drive B: NONE
5. Floppy 3 Support: Disabled

B. Advanced BIOS Features

1. Antivirus: Disabled
2. CPU Internal Cache: Enabled
3. External Cache: Enabled
4. Processor Number Feature: Enabled
5. Quick Power On Self Test: Enabled
6. First Boot Device: HDD-0
7. Second and Third Device: Disabled
8. Boot Other Enabled(needed for wakeonlan)
9. Swap Floppy: Disabled
10. Boot up Floppy Seek: Enabled
11. Leave the rest as Default

C. Advanced Chipset Features

1. ADV DRAM Control: Auto (leave 2nd entry alone)
2. System and Video Cacheable: Enabled
3. Memory Hole: Disabled
4. Memory Parity Check: Enabled

D. Integrated Peripherals

1. SIS 730 OnChip IDE:
   a. Internal PCI/IDE: Both
   b. IDE Burst Mode: Enabled
   c. Everything Else: Auto
2. SIS 730 OnChip PCI: All Enabled
3. SIS 950 Super IO Device:
   a. Onboard FDC: Enabled
   b. Onboard Serial Port: 3F8/IRQ
   c. UART 2 Mode Controller: Disabled
   d. Onboard Parallel: 378/IRQ
   e. Parallel Port Mode: ECP+EPP
   f. ECP Mode Use DMA: 3
   g. Leave the rest as Default
4. H/W Reset Function: Enabled
5. USB Controller: Enabled
6. Onboard PCI LAN: Disabled
7. Leave the rest as Default

E. Power Management

1. ACPI Function: Enabled
2. Video Off Option: Always On
3. HDD Off After: Disabled
4. PM Wakeup Events:
   a. IRQ [3-7, 9-15]: Enabled
   b. PC/PME Power Up Control: Enabled

c. Leave the rest as Default
5. Power Resume Control: Always On

F. PnP/PCI Configurations

1. Reset Configuration Data: Enabled
2. Leave the rest as Default

G. PC Health Status

1. Shutdown Temp.: 65˚C / 149˚F

H. Voltage Frequency

2. Set Voltage CPU / DRAM: default

I. Set Password

1. wXXXXXXe (lowercase)
2. *Save + Exit Setup*

Component Checklist - PAC and Atrium Workstations

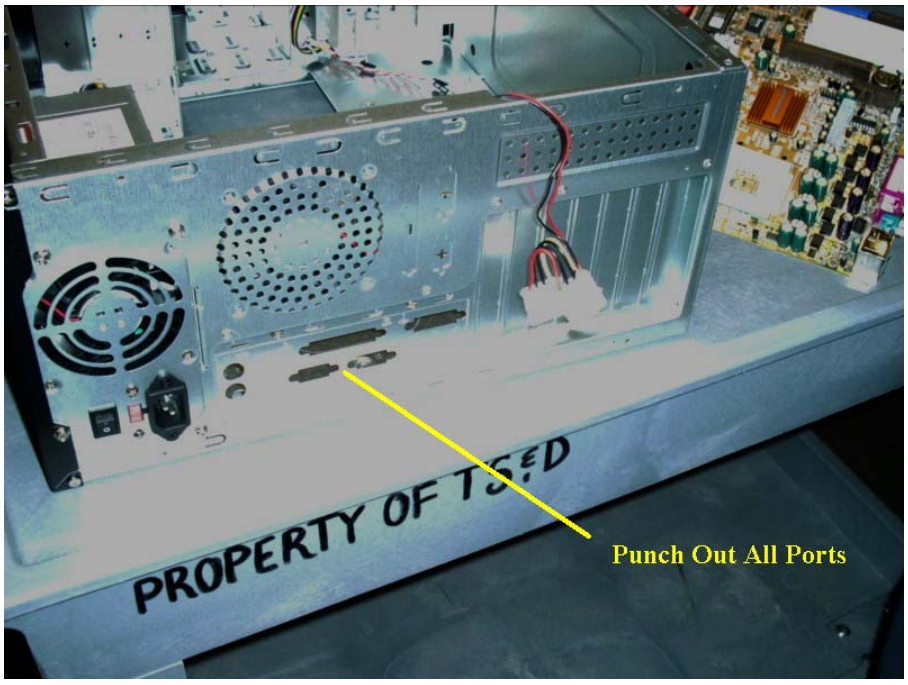
TYPE	ITEM	QTY	COLOR	CODE	ROOM	SHELF
Case	Hon Hai 7C443-115 ATX Case, With P4 Power Supply, Black Color	60	NEON SALMON	1	telcom 217w	floor
CPU	AMD Duron 1ghz OEM	60	NEON SALMON	2	117	4
CPU Fan	Coolermaster Universal Fan	60	NEON SALMON	3	117	2
Floppy Drive	Teac FD235HFA29 1.44MB	60	NEON SALMON	4	117	2
Keyboard	Belkin Classic Keyboard (black)	60	NEON SALMON	6	117	3
LAN	Intel Pro/100 S Desktop Adapter w/3DES 168-Bit Encryption	60	NEON SALMON	7	117	4
Motherbd	ECS K7SEM-266	60	NEON SALMON	9	117	1
Mouse	Logitech Optical Mouse	60	NEON SALMON	10	117	4
RAM	512mb PC133	60	NEON SALMON	11	117	2
Security Lock	Hex Nut	60	NEON SALMON	12	117	2
ZIP	Zip 250	60	NEON SALMON	13	117	2

Atrium/PAC Workstation Assembly Instructions

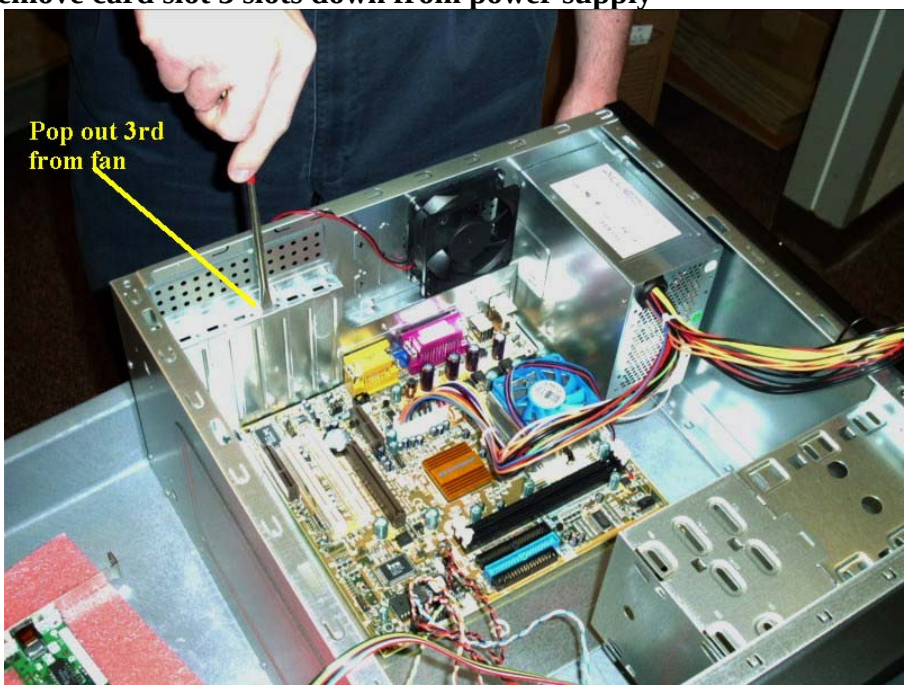
STEP 1

A. **Remove case from packaging**
B. **Open case**
C. **Remove case screws and power cord (put in sorter)**

D. **Punch out PS/2 ports using a screwdriver and pliers to break away pieces**



E. **Remove card slot 3 slots down from power supply**



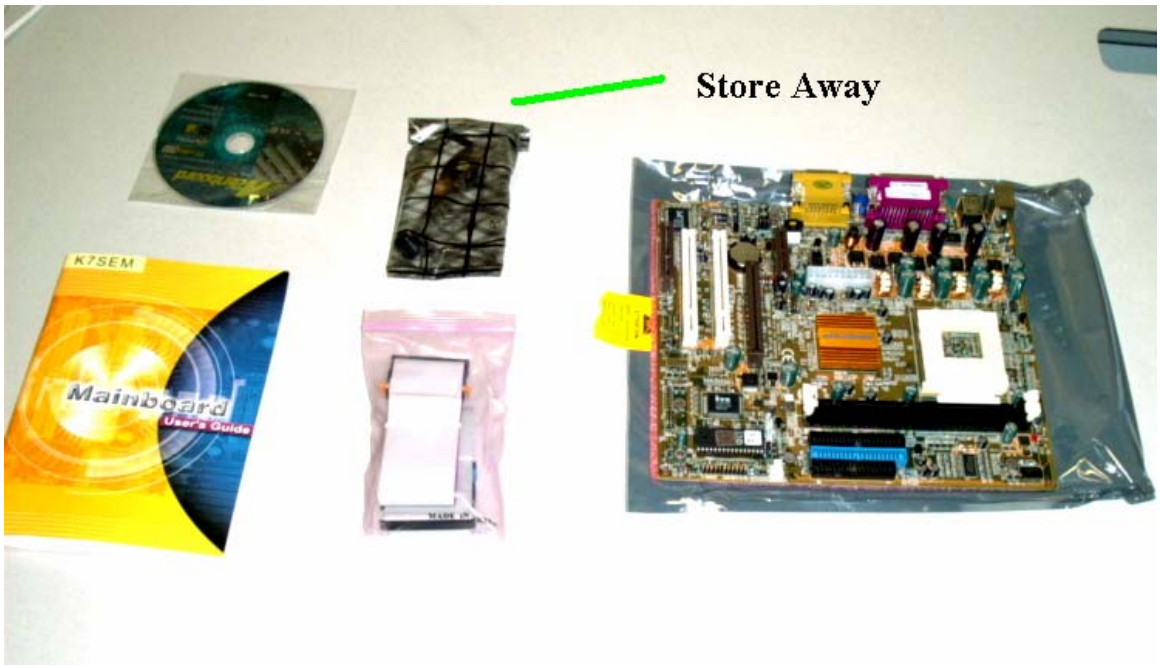
F. **Put case cover back on**

G. **Store in closet**

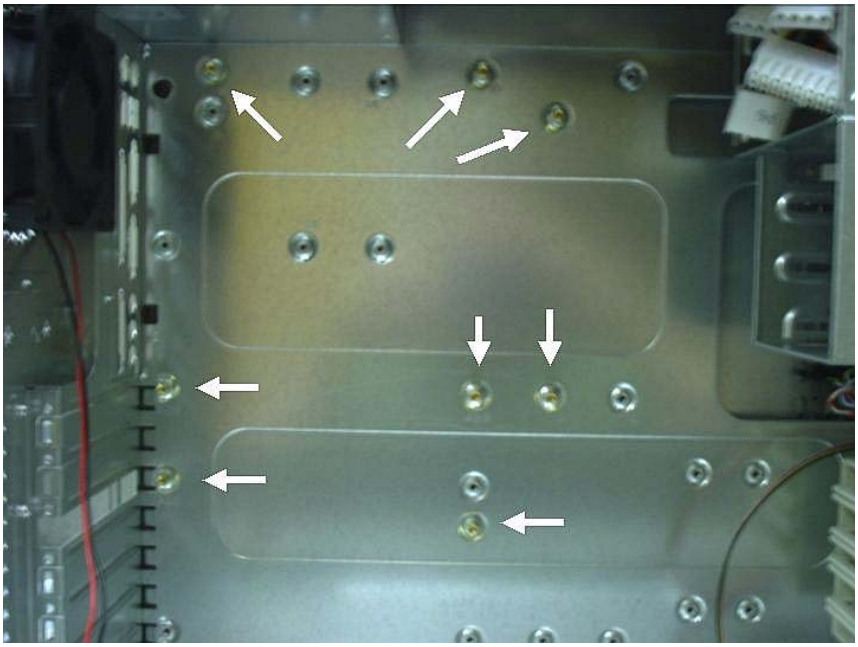
STEP 2

A. **Prepare sorter**
B. **Remove contents from motherboard box**

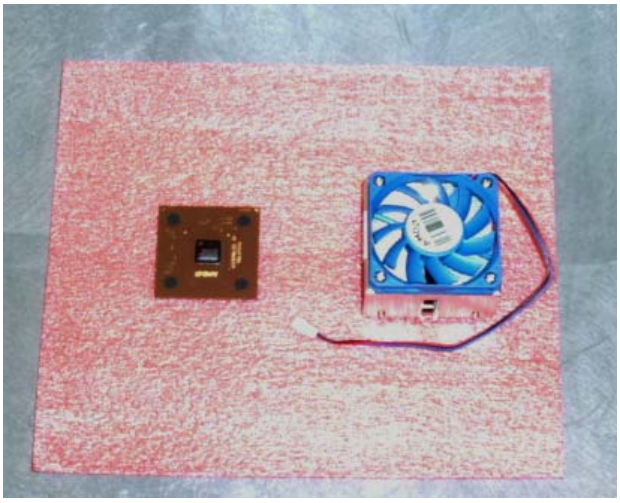
C. Store away LAN connector



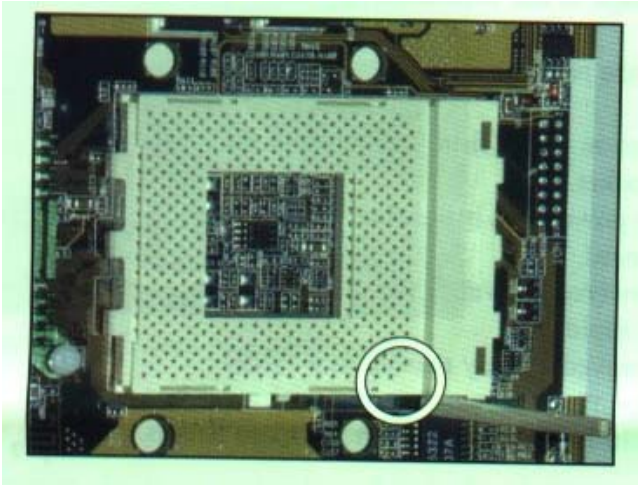
D. Screw in motherboard mounting risers



E. Place CPU and CPU Fan on anti-static mat

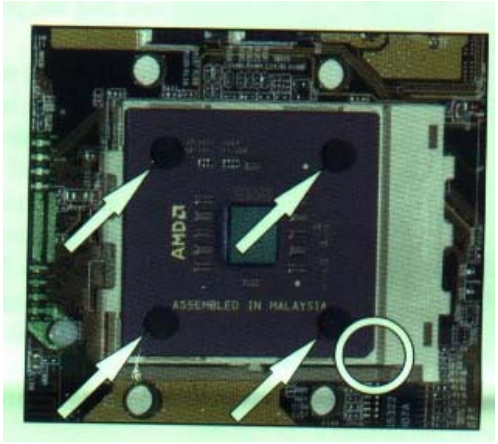


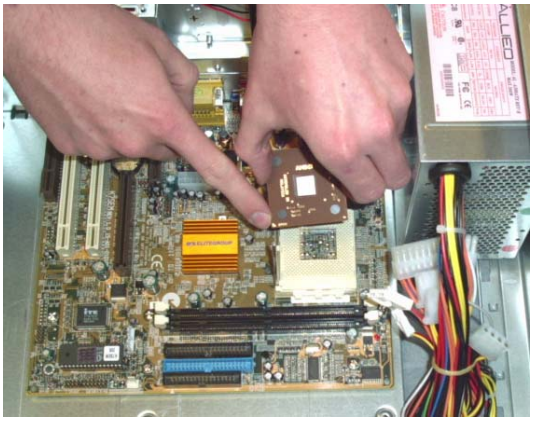
F. Identify CPU notch placement on Motherboard CPU socket (cut corner)



G. Raise CPU socket arm

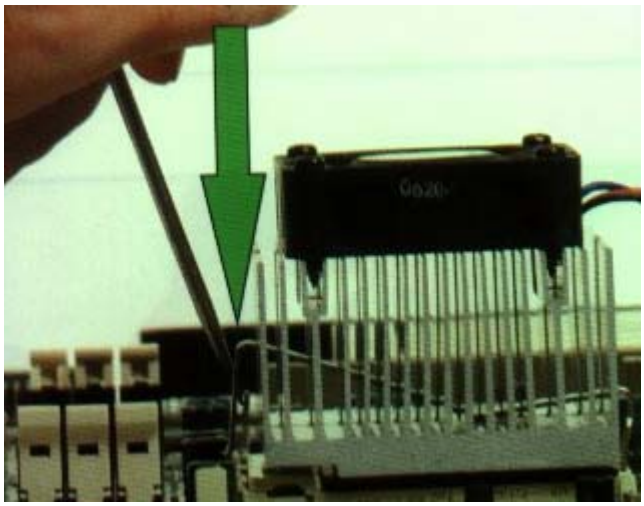
H. Identify CPU notch location on CPU (cut corner) and place CPU in socket

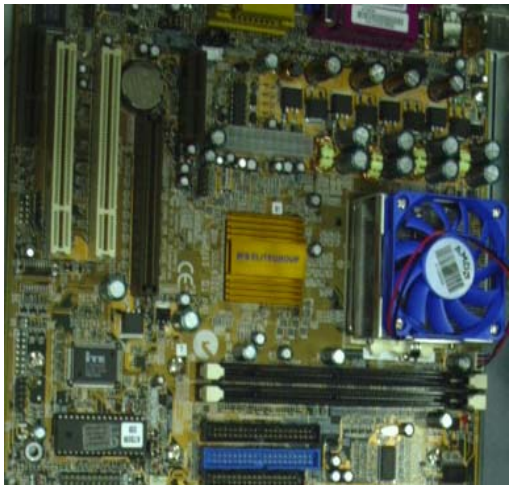




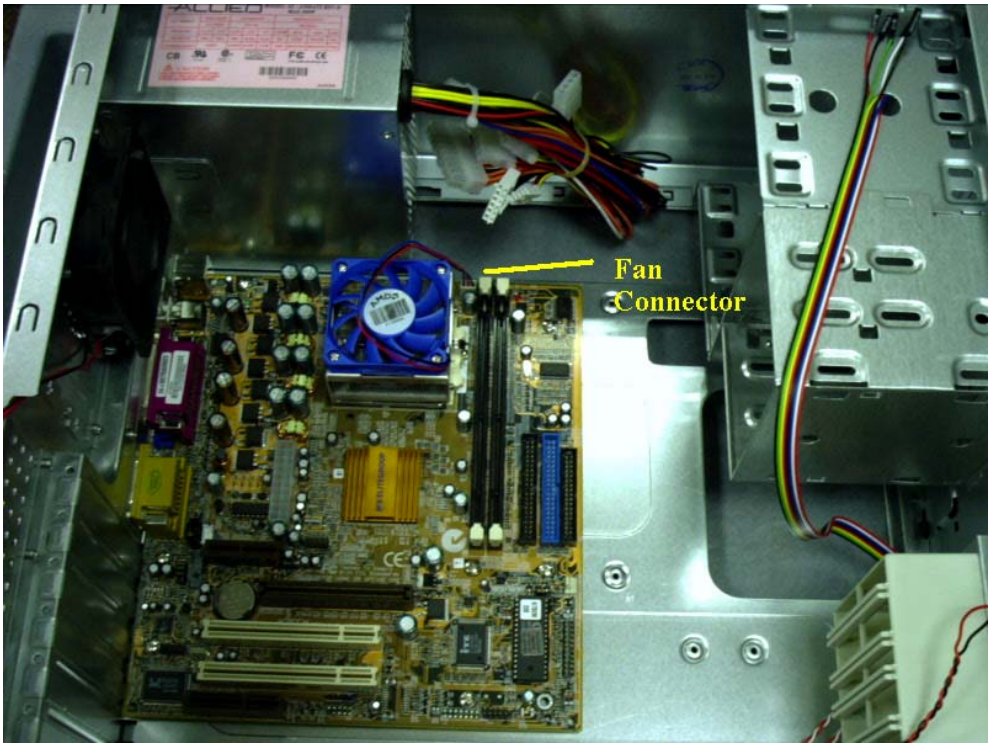
I. **Lower arm back into socket snap**
J. **…**

K. **Attach CPU heatsink to CPU (Use large flathead screwdriver to press down and hook into place the heatsink clamp)**





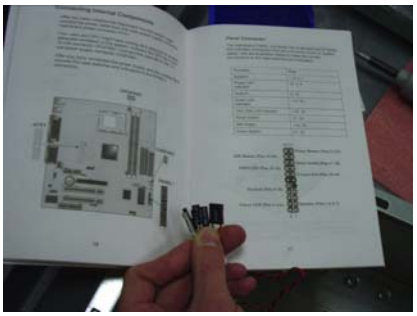
L. Connect CPU fan to motherboard



M. Mount motherboard to case

STEP 3

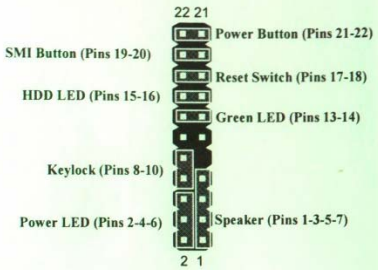
A. Find case cable connector diagram in motherboard manual (good luck)



Panel 1: Panel connectors for switches and indicators

Use the panel connector to implement the switches and indicators on your system case.

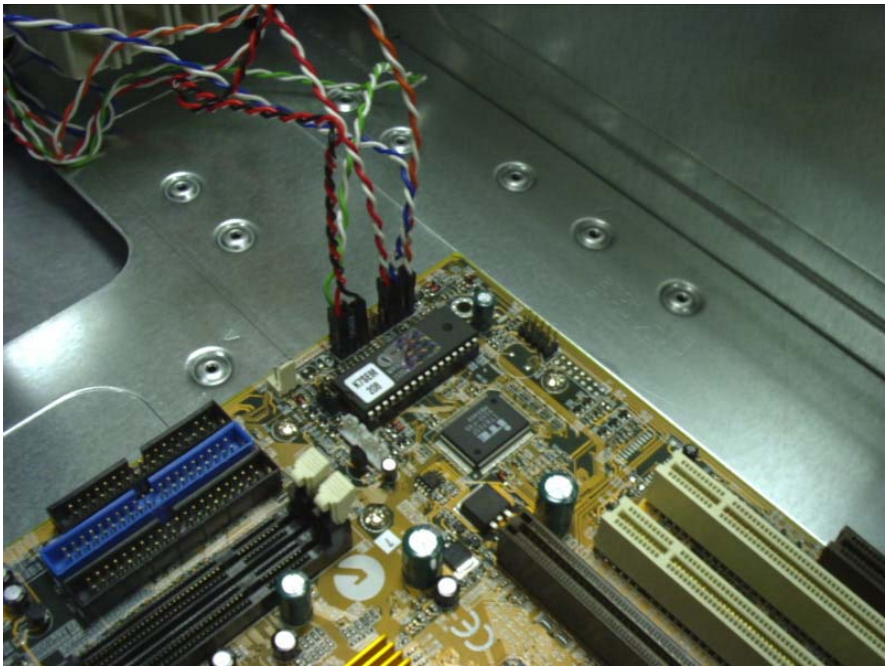
Function	Pins
Speaker	1, 3, 5, 7
Power LED	+2, 4, 6
Keylock	8, 10
Green LED	+13, 14
Hard Disk LED	+15, 16
Reset Switch	17, 18
System Management Interrupt (SMI) Button	+19, 20
Power Button	21, 22



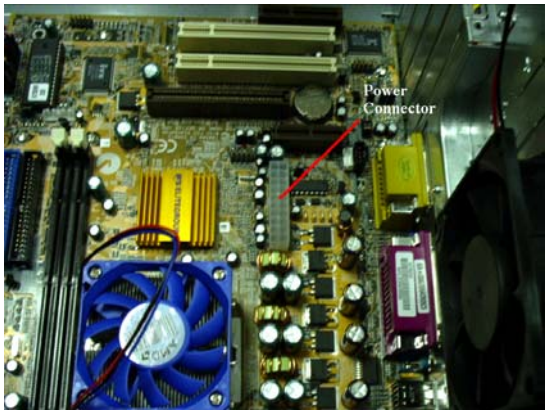
***Note:** The plus sign (+) indicates a pin which must be connected to a positive voltage.*

Speaker ground (black) goes to pin 1
Do <u>not</u> use pin 4 for Power LED

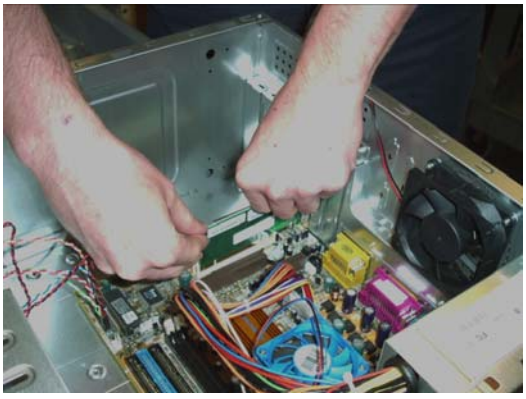
B. Connect case cables to motherboard following instructions from manual



C. Plug in power cable and case fan



D. Get network card and place in first PCI slot from power supply

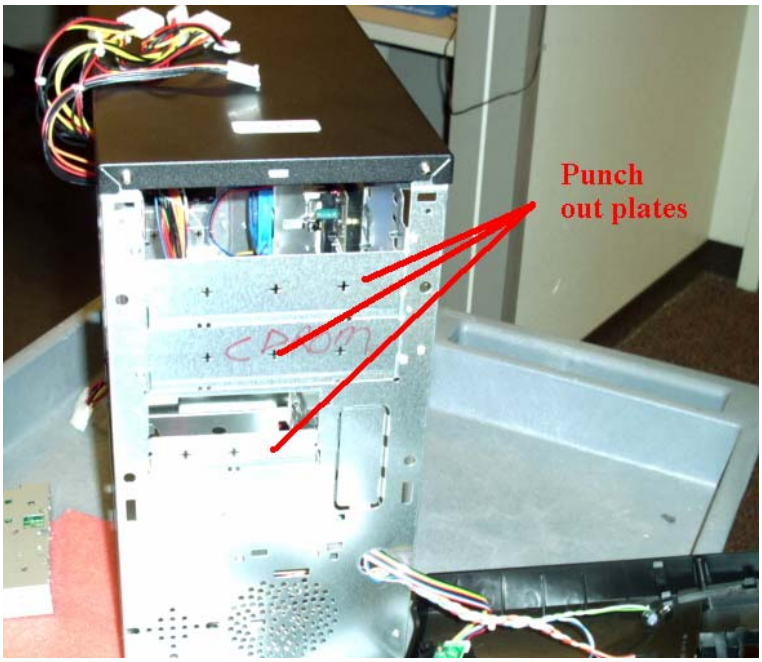


STEP 4

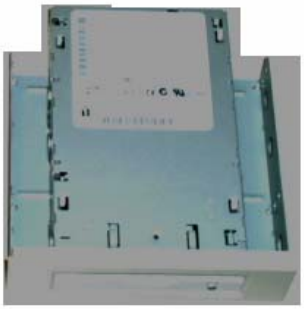
A. Gently press on the bottom tabs to release the case faceplate

B. Repeat on sides and top (total of 6)

C. Punch out drive plates

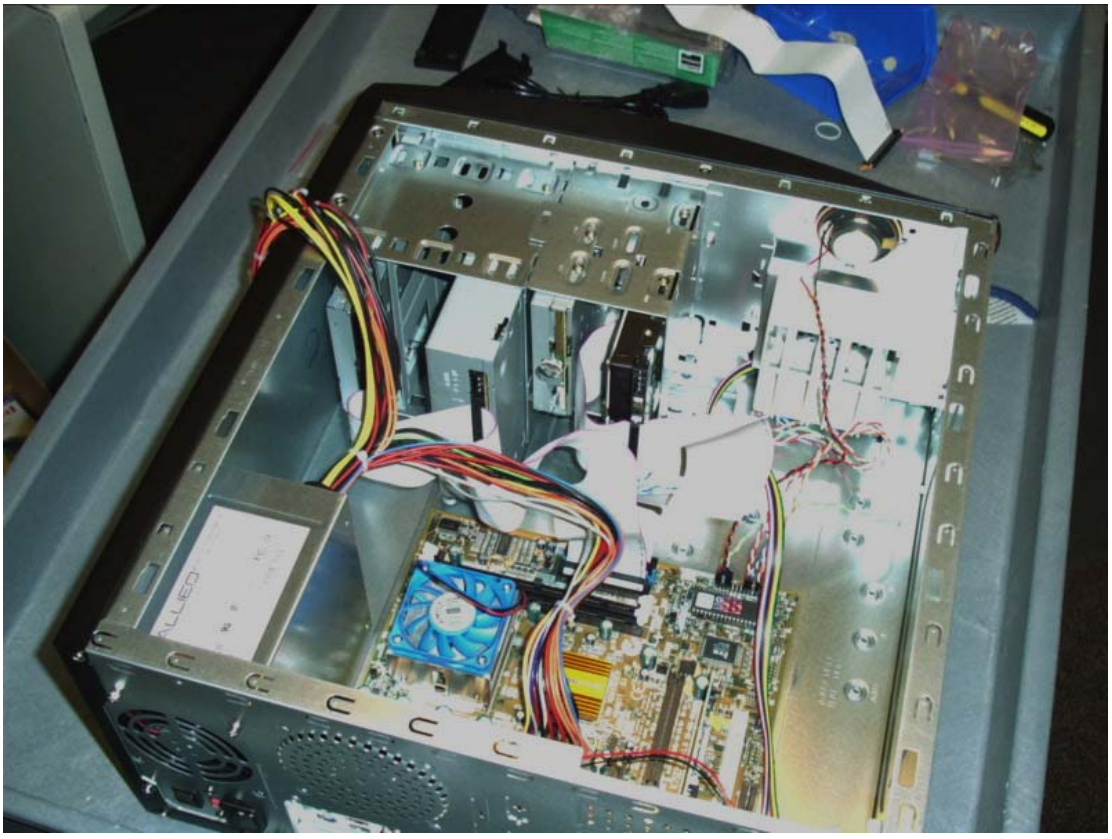


D. Gather drives for mounting (zip, floppy)



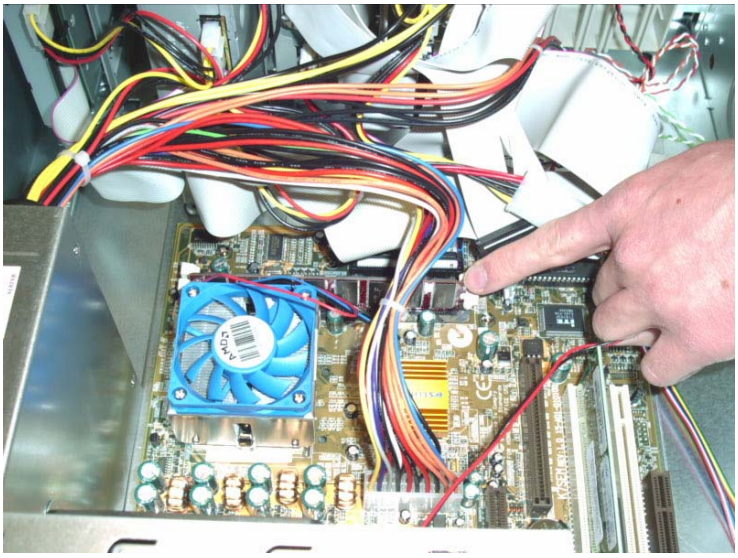
E. Mount floppy and zip drives in drive bays

F. Attach drive cables and power to drives and motherboard (red ribbon on cable is pin 1 and closest to power connector) Zip drive to the SECONDARY IDE

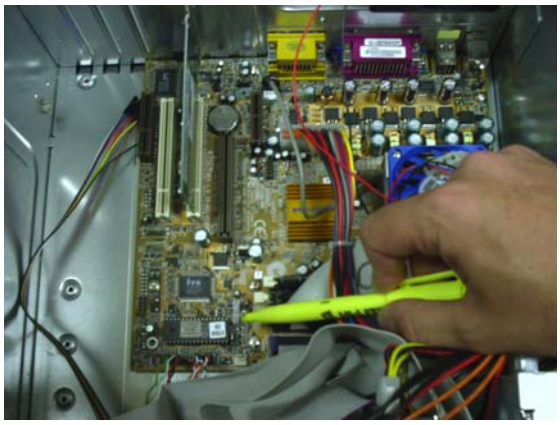


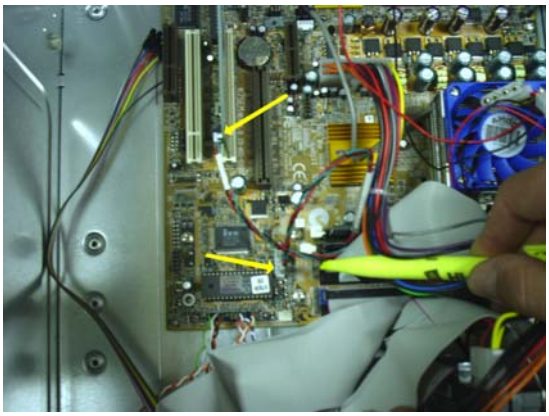
STEP 5

A. Insert 1GB of RAM into the slots closest to CPU



B. Install Wake-On-LAN cables





C. Finish by putting case cover back on

D. Put Asset Tags inside bottom of case
E. Put white on clear machine name label on top of case

STEP 6

A. Connect keyboard, mouse, power cable, and monitor
B. Turn power on
C. Verify power light is on
D. Enter BIOS

*** Note: The use of the word “Default” means leave setting as is.

Standard CMOS

1.	Set Date	Current
2.	Set Time	Current
3.	IDE Primary Master	None
4.	IDE Primary Slave	None
5.	IDE Secondary Master	None
6.	IDE Secondary Slave	AUTO
7.	Drive A:	1.44m, 3.5 in.
8.	Drive B:	NONE
9.	Floppy 3 Mode Support:	Disabled
10.	Video	EGA/VGA
11.	Halt on:	All Errors

Advanced BIOS Features

1.	Antivirus Protection:	Disabled
2.	CPU Internal cache:	Enabled
3.	External Cache:	Enabled
4.	Processor Number Feature:	Enabled
5.	Quick Power On Self Test:	Enabled
6.	First Boot Device:	LAN
7.	Second Boot Device:	Disabled
8.	Third Boot Device:	Disabled
9.	Boot other Device:	Enabled
10.	Swap Floppy Drive:	Disabled
11.	Boot Up Floppy Seek:	Enabled
12.	Boot Up NumLock Status:	On
13.	Gate A20 Option:	Fast
14.	Typematic Rate Setting	Disabled
15.	Security Option	Setup
16.	OS Select for DRAM > 64MB	Non-OS2
17.	HDD S.M.A.R.T. Capability	Disabled
18.	Report NO FDD for Win 95	Yes

Advanced Chipset Features

1.	Advanced DRAM Control 1:	
	a. Auto Configuration	Auto
	b. DRAM Background Command	Delay 1T
	c. LD-OFF DRAM RD/WR Cycles	Delay 1T

2. Advanced DRAM Control 2:

a. SDRAM CAS Latency	3T
b. SDRCLK Control	-1.0 ns
c. SDWCLK Control CS#/CKE	+2.0 ns
d. SDWCLK Control MA/SRAS	+0.5 ns
e. SDWCLK Control Hi DQM/MD	+1.0 ns
f. SDWCLK Control Lo DQM/MD	+1.5 ns

3. System BIOS Cacheable:	Enabled
4. Video RAM Cacheable:	Disabled
5. Memory Hole 15M-16M	Disabled
6. Memory Parity Check	Enabled
7. AGP Aperture Size:	64MB

Integrated Peripherals

1. SIS 730 OnChip IDE Device:

a. Internal PCI/IDE	Both
b. IDE Primary Mater PIO:	Auto
c. IDE Primary Slave PIO:	Auto
d. IDE Secondary Master PIO:	Auto
e. IDE Secondary Slave PIO:	Auto
f. Primary Master UltraDMA:	Auto
g. Primary Slave UltraDMA	Auto
h. Secondary Master UltraDMA:	Auto
i. Secondary Slave UltraDMA:	Auto
j. IDE Burst Mode:	Enabled

2. SIS 730 OnChip PCI Device:

a. SIS-7018 AC97 Audio	Enabled
b. SIS-7013 S/W Modem	Disabled

3. SIS 950 Super IO Device:

a. Onboard FDC Controller	Enabled
b. Onboard Serial Port 1	3F8/IRQ4
c. UART 2 Mode Controller	Disabled
d. Onboard Parallel Port	378/IRQ7
e. Parallel Port Mode	ECP+EPP
f. ECP Mode Use DMA	3
g. Game Port Address	201
h. Midi Port Address	330
i. Midi Port IRQ	10

4. H/W Reset Function	Enabled
5. USB Controller	Disabled
6. IDE HDD Block Mode	Enabled
7. Onboard PCI LAN	Disabled
8. Init Display First	AGP

9.	AGP Auto Calibration	Enabled
10.	System Share Memory Size	8MB

Power Management Setup

1.	ACPI Function	Enabled
2.	ACPI Suspend Type	S1 (POS)
3.	Video Off Option	Always On
4.	Video Off Method	DPMS Supported
5.	Switch Function	Break / Wake
6.	Modem Use IRQ	3
7.	Hot Key Function as	Disabled
8.	HDD Off After	Disabled
9.	Power Button Override	Instant Off
10.	Power Resume Control	Always On
11.	PM Wakeup Events	
	a. IRQ (3-7 9-15) NMI	Enabled
	b. IRQ8 Break Suspend	Disabled
	c. RING Power up Control	Disabled
	d. PCIPME Power up Control	Enabled
	e. KB Power on Password	Enter
	f. Power up by alarm	Disabled

PnP/PCI Configuration

1.	Reset Configuration	Disabled
2.	Resources Control by	Auto (ESCD)
3.	PCI/VGA Palette Snoop	Disabled

PC Health Status

1.	Shutdown Temperature	65°C/149°F

Frequency / Voltage Control

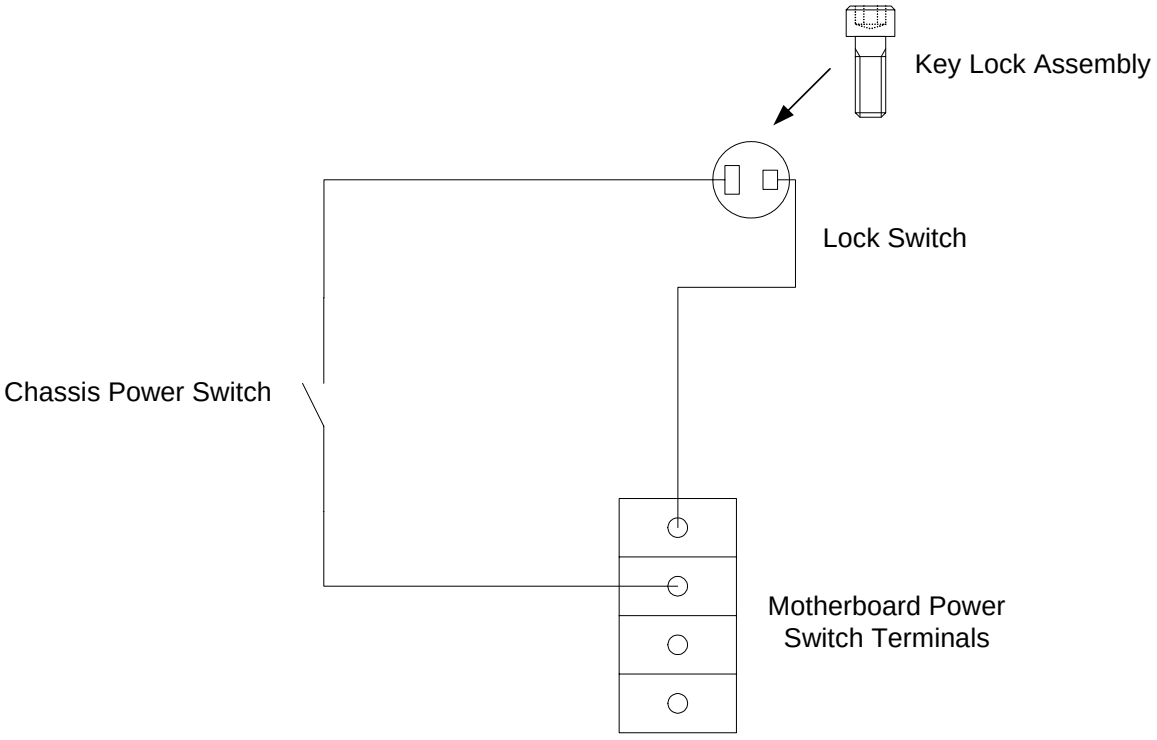
1.	Auto Detect DIMM/PCI Clk	Enabled
2.	Spread Spectrum	Enabled
3.	CPU HOST / SDRAM / PCI clock	Default

Set Password

1. XXXXXX [lowercase]
2. Save and Exit *Setup*

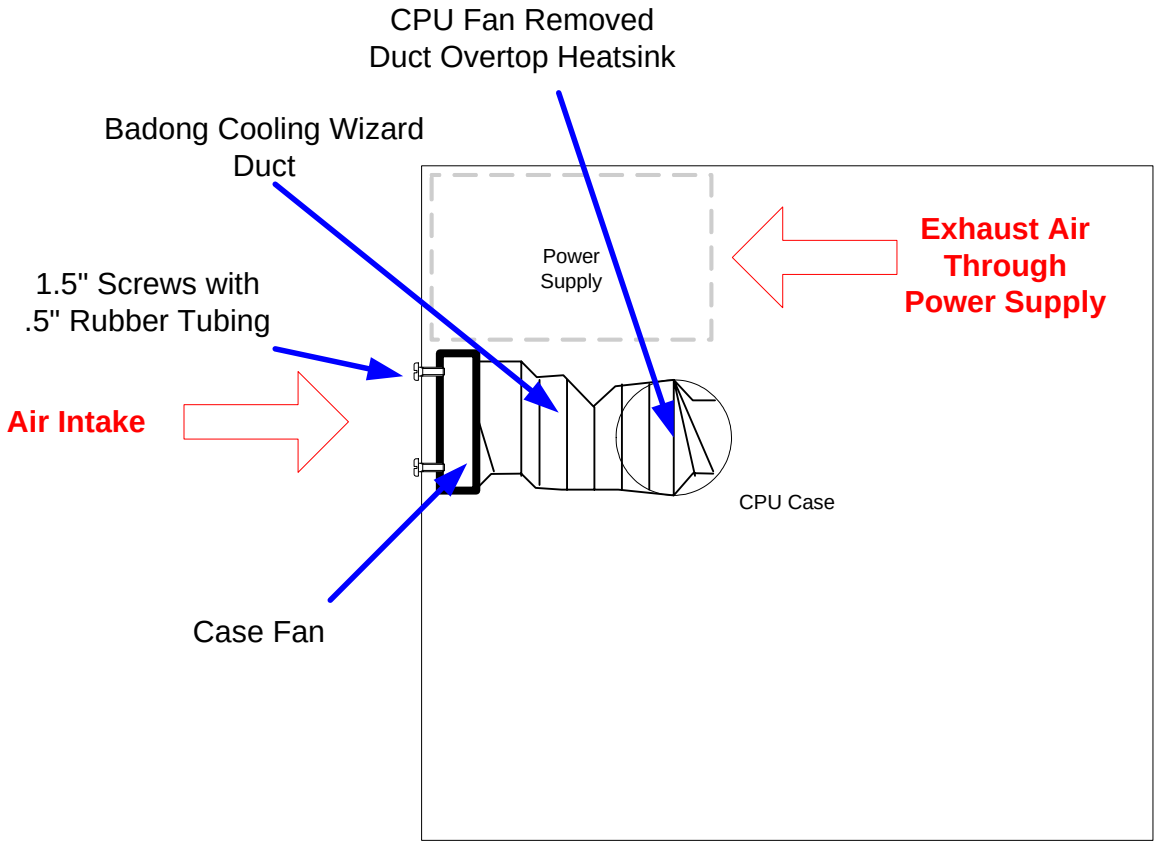
Power Cutoff Switch

Each workstation requires a cutoff switch to prevent unwanted power switching. All workstations use WOL (Wake On LAN) for power management. A key lock is used to disable the power switch on the workstation chassis. An end user can use the RESET switch to reset a workstation, but she cannot use the power toggle switch. This ensures all workstations are in a POWER ON state. All necessary power state requirements are then directed by remote server calls. If technical support staff need the power switch enabled, a key is used to switch the power circuit into a closed circuit.



Noise Reduction

Each workstation needs modifications to the hardware in order to reduce noise. Badong (PCPhile) offers a CPU Cooling Wizard duct system for AMD processors [www.cyberguys.com]. This kit is intended to be used for reducing heat. The components of this kit can be used for an alternate function- noise reduction. By removing the CPU fan, reversing the case exhaust fan so it becomes an intake fan using 1 ½" screws with ½" length rubber tubes as insulators on the inside-case portion, the Cooling Wizard duct can be mounted directly onto the CPU heat sink and repositioned/reversed case fan. This allows for internal air to enter the duct through a ½" opening between the case and the case fan and an exhaust using the case power supply. This can reduce over 20db of noise with a marginal increase in CPU temperature of about 2 degrees Celsius.



Future

The E3 project has enabled the ASU West Campus Library to build on a solid open source/open architecture foundation. Future projects will take advantage of this architecture and deliver new and improved services with it. The following future activities reflect this.

III Circulation Stations

Currently the Library has three circulation workstations that are using the III Millennium Java client on a Windows NT platform. In addition, circulation has one workstation that utilizes the Linux RAMDisk model for image delivery and III Java Client access. All III circulation stations will be converted to the new model for improved reliability and improved just-in-time currency.

Library Classroom

The ASU West Library classroom consists of 28 client student workstations and one instructor station. The student workstations have a requirement for using a Web browser, Microsoft Word and Excel applications, and Inspiration software. A conversion of these workstations from Windows NT to the Linux RAMDisk model has been tested and can be accomplished by adding OpenOffice for the Word and Excel needs and Inspiration running under WINE. The instructor workstation has a Trios hard drive switcher in it which can be used to switch from a PXE image boot environment (same as student stations) or select the internal hard drive with Windows 2000 loaded on it for the general needs of Library staff.

Library Website Migration

The Library Website currently resides on an ASU West IT managed Microsoft IIS server utilizing ColdFusion MX Server for inline tagging. The Website will be moved in-house using the WLIBNET Linux server running Apache Web Server and PHP for scripting. This strategic move allows for local accountability and control, in addition to expanded capabilities using the PHP scripting language.

Pharos UniPrint Print Management System

The Library wishes to utilize the Campus Print Management System to facilitate chargeback and consumption quotas for printing in the Library. Integration with this system is completely feasible under the E3 model with the addition of a custom client pop-up application requesting the naming of a print job. The release stations for the Pharos system requires a Microsoft Windows operating system for the release software. To take advantage of the Linux RAMDisk model for these release stations, the Library will use WINE as the interpreter for the Pharos Release Station software.

Library IntraNet

The WLIBNET server created during the E3 project will be used for not only development of future versions of the Library Website, but also for hosting the Library IntraNet. The IntraNet will utilize the Apache Web Server, PHP, MySQL databases, and hardware RAID to deliver functional/feature-rich applications and services for Library staff.

Definitions

Desktop Environment	A desktop environment is software which provides the end user a means of manipulating aspects and controlling behavior of items maintained by an operating system (see OS). A desktop environment is typically a graphic user interface displaying picture representations of applications, files, and OS functions.
E3	see Evolution 3
Evolution 1	Transform Library catalog access from a physical card catalog to an electronic database. The database and client access software resides on a mainframe or mini-computer. Access to the catalog is through a dumb terminal accessing a mainframe session through a terminal service.
Evolution 2	Offload computer processing resources from the mainframe to a fat-client desktop computer. Access applications reside locally on the workstation and access to resources may involve connecting to a server. These stations require a local operating system and storage device.
Evolution 3	Provide the same functionality of a fat-client (Evolution 2) while improving performance and application integrity. A change in base operating system and input/output methods keeps the total cost of ownership to a minimum while maintaining high availability and flexibility of services.
Fat Client	Opposite that of a Thin Client. Fat Clients perform computing and content delivery locally, although they may be connected to a network. Fat Clients usually consist of a display device, input devices, storage devices (hard drive, removable media drives), and network connectivity.
FUSS	Framing User Support Services data gathering project using student, faculty, and staff focus groups to provide insight on Library strategic planning.
GPL	General Public License
KDE	The K Desktop Environment provides a graphical user interface to UNIX systems. KDE offers a transparent interface to both X enabled applications and console (terminal screen) applications. KDE is written purely in QT and provides an extensive backend server to the desktop allowing real-time customization and interaction with QT enabled applications through the use of DCOP.

Linux	Pronounced with a short "i" is an open-source version of the UNIX operating system designed originally for the x86 PC architecture.
Open Source	A philosophy and means for software licensing and distribution which allows the use of and modification of software written by others either collectively or individually. Open Source licensing also ensures the methods to freely share the software and source code with anyone who accepts the open source license. A common open source license is GPL. See http://www.oreilly.com/catalog/opensources/book/perens.html
OS	An operating system is the software which interacts with computer hardware to provide data processing and a means for applications to run.
Print Management System	A managed printing system includes methods to allow control over printing activities. These controls can include allowing or denying access to print, print accounting, hold-cancel-schedule print jobs, and report historical data based on user-defined parameters.
Qt	Qt is a multi-platform C++ language graphical user interface development toolkit.
RAID	Redundant Array of Inexpensive Drives. A RAID provides multi-disk management of data typically using hardware to control the process. RAID technologies can provide fault tolerance for disk failure and increase the performance of disk input and output.
RAMDisk	A RAMDisk is like a hard drive but without the actual drive. An RD uses a portion of memory as a hard drive partition. Through the use of large amounts of RAM, a computer system can have a hard drive image placed into RAM and accessed like a physical hard drive. The RAM is partitioned out into drive space and application memory space for increased speed and integrity.
ROI	Return On Investment.
SDLC	Systems Development Life Cycle. SDLC is a tool used to guide the process in identifying, developing, implementing, and postmortem review of a project.
TCO	Total Cost of Ownership. TCO is a calculation to both direct and indirect costs and benefits related to the purchase of any asset. The purpose of a TCO analysis is to arrive at a final figure that will reflect the effective cost of purchase, all things considered. TCO analysis was created by the Gartner Group. TCO analysis performs calculations on burdened cost of

	purchases. Burdened cost should include costs of purchase, repairs, maintenance, upgrades, service and support, networking, security, user training, and software licensing. TCO is then compared to TBO (total benefits of ownership) to reflect the viability of the purchase.
Thin Client	Networked hardware that relies on a server to perform computing and content delivery functions. Thin Clients usually consist of a display device and an input devices (keyboard/mouse) with connectivity via a network.
TS&D	ASU West Library Technology Support & Development department
VPN	Virtual Private Network. A point-to-point method of network access which allows a remote client to connect to a destination and behave is if the client were actually local.
WINE	[W]INE [I]s [N]ot an [E]mulator. WINE is an open source project that includes a Microsoft Windows API built from the ground up. This application can fake a Windows file system and registry, including execution of Microsoft Windows-based 16 and 32-bit applications.